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LIMNOCITRUS, A NEW GENUS, ALSO NEW SPECIES OF WENZELIA, PARAMIGNYA AND ATALANTIA (RUTACEAE–AURANTIOIDEAE)

WALTER T. SWINGLE

With four plates

THE PRESENT paper adds one new genus and several new species to the Orange subfamily AURANTIOIDEAE of which I am preparing a synopsis to be published shortly. This paper supplements the one that I published in this JOURNAL last April.[1]

Some seventy-five years ago (about 1862) a curious plant was discovered by J. E. Teysmann, a well known botanical collector, growing near the seashore at Rembang on the north shore of the island of Java. In 1864 this plant was published as a new species by F. A. W. Miquel and placed doubtfully in the genus *Paramignya* (*P. ? littoralis*). The discoverers of the plant, J. E. Teysmann and S. Binnendijk, published also in 1864 additional notes based on Teysmann's observations. Herbarium specimens of the type material were sent to the National Herbarium (Rijks Herbarium) at Leiden, Holland, and to the Botanical Garden at Buitenzorg in Java. This plant then disappeared from notice for nearly half a century. In 1912 Valeton published a lithographic plate of this species based on the original type material deposited in the herbarium at Buitenzorg. The plant was rediscovered at about this time in Annam, French Indo-China, at Nha-trang and a few years later to the north at Tourane near the seashore.

Thanks to the loan of Miquel's type specimen from the Rijks Herbarium at Leiden and excellent material from Indo-China found in several

[1]Swingle, Walter T., *Clymenia* and *Burkillanthus*, new genera also three new species of *Pleiospermium* (in Jour. Arnold Arboretum 20: 250–263, pls. 1–3. 1939).

American herbaria, I have been able to work out the morphology of the flowers and fruits by using the modified Juel technique.[1]

As a result of these studies, I find that this little known plant, variously classed in the genera *Paramigyna, Limonia, Atalantia* and *Pleiospermium* by leading taxonomic botanists familiar with the genera of *Rutaceae,* cannot be placed in any of these genera, but is the type of a new genus for which I propose the name *Limnocitrus.*[2]

Limnocitrus, gen. nov.

Pleiospermio affine sed differt (1) foliis simplicibus, (2) petiolis apteris, brevissimis, pulvinoideis, (3) disco cupulato, (4) ovario longitudinaliter multisulcato, costis minutissime inter sulcos hirsutis, (5) vesiculis pulpiferis gracilibus, elongatis subfusiformibus, ad basim plus minusve contractis.

Frutex vel arbuscula, 2–3 m. alta, ramulis glabris, spinis singulis axillaribus; foliis simplicibus, coriaceis, late ellipticis vel obovatis, apice obtuse vel truncate acuminato, ad basim cuneatis; petiolis brevissimis (quam lamina decemplo vel plus brevioribus), pulvinoideis, non-articulatis; floribus 4- vel 5-meris; pedicellis brevibus, glabris; alabastris magnis, oblongis, viridibus; calycibus latis, 4–5-lobatis, lobis triangularibus, obtusis; petalis crassis, lineari-lanceolatis, viridi-albis; staminibus 10, filamentis liberis, glabris, antheris linearibus; disco cupulato; ovario oblongo-ovoideo, 12–20-sulcato, hirsuto, loculis 4 vel 5, ovulis 2 in quoque loculo; stylo gracili, paulo pubescente, stigmate paulo capitato; fructu globoso vel subgloboso, magno, pericarpio glanduloso-punctato, aureo-flavo, maturitate vesiculis pulpiferis numerosissimis gracilibus acutis ad basim contractis instructo; seminibus magnis, ovoideis, plus minusve applanatis, mono-embryonatis.

TYPE SPECIES: *Paramignya ? littoralis* Miquel in Ann. Mus. Bot. Lugd.-Bat. **1**: 211 (1864).

DISTRIBUTION: East India, Rembang, Java (type locality), Bali; French Indo-China (Annam and Cochin China).

This genus somewhat resembles *Pleiospermium* but differs from it in many important characters that are not shown by any of the five known species of that genus. *Limnocitrus* has thick, coriaceous, veiny, simple

[1]Swingle, Walter T., Clymenia, etc., l.c. 251, also Tillson, Albert H. & Bamford, Ronald, The floral anatomy of the AURANTIOIDEAE (in Amer. Jour. Bot. 25:780–793. 1938). Dr. Tillson again gave me his skilled assistance in preparing serial microtome sections of the plants discussed in this paper.

[2]From the Greek λίμνη, swamp or salt marsh, and *Citrus,* in allusion to its frequent occurrence in tidal marshes which are subject to occasional overflow of brackish water.

leaves borne on very short (about 1/10 as long as the leaf-blade), wingless petioles which are pulvinoid for their entire length and not articulated with the leaf-blade (Plate 1, figure 1), while the leaves of *Pleiospermium* are thinner, less veiny, and have long, well-developed petioles often winged and always articulated with the leaf-blade. *Limnocitrus* has a cup-shaped disk, and a relatively very large calyx expanded by the petals which are thickened toward the base and reflexed at the tips in anthesis. The ovary is most unusual in having numerous (12–20) longitudinal furrows with narrow ridges between, bearing numerous long, white bristles (Plate 1, figures 2, 6).

The fruits, which resemble small oranges, have the locules filled with long slender pulp-vesicles that taper to an acute apex and are more or less bluntly contracted where they are attached to the dorsal walls of the locules (Plate 1, figures 4, 5). The characters shown by these pulp-vesicles clearly distinguish *Limnocitrus* from the other related genera which I place in the subtribe *Citrinae* of the tribe *Citreae*. *Limnocitrus* and the genera most clearly related to it, *Severinia, Pleiospermium, Burkillanthus* and *Hesperethusa,* constitute a group which I have called Primitive Citrus Fruit Trees.[1]

The pulp-vesicles of *Limnocitrus* are somewhat intermediate in character between those of *Pleiospermium* and those of the True Citrus Fruit Trees such as *Citrus* and closely related genera. The fruits of *Limnocitrus* were described by A. Guillaumin (in Bull. Soc. Bot. France, **60**: 442. 1913), in translation as follows: "The fruits, as a matter of fact, resemble small oranges about 4 cm. in diameter, with 5 locules almost completely occupied by the 2 very large seeds surrounded by succulent hairs as in the genus *Citrus* and in *Atalantia citroides.*"

Although *Limnocitrus* is apparently a connecting link between The Primitive Citrus Fruit Trees, such as *Pleiospermium,* and the True Citrus Fruit Trees such as *Microcitrus,* it must be kept in mind that *Limnocitrus* shows striking characters in the ovary with its numerous longitudinal furrows separating low ridges which carry lines of long, white bristly hairs — characters not found in any other genus of the tribe *Citreae* or even in any of the whole subfamily AURANTIOIDEAE.

Limnocitrus littoralis (Miquel) Swingle, comb. nov. PLATE 1

Paramignya ? littoralis Miquel in Ann. Mus. Bot. Lugd.-Bat. **1**: 211. 1864; Teysmann and Binnendijk in Natuur. Tijdschr. Nederl.-Indië **27**: 41. 1864.

Limonia littoralis (Miq.) Backer, Schoolflora voor Java, 185. 1911.

[1]Swingle, Walter T., A new taxonomic arrangement of the Orange subfamily, *Aurantioideae* (in Jour. Wash. Acad. Sci. **28**: 530–533. 1938).

Atalantia littoralis (Miq.) Guillaumin in Bull. Soc. Bot. France. **60**: 442. 1913.

Pleiospermium littorale (Miq.) Tanaka in Bull. Mus. Hist. Nat. Paris 2. sér. **2**: 52. 1930.

ILLUSTRATIONS: Th. Valeton in Icones Bogorienses. **4**: 163, 164, pl. 349. 1912.

Species unica.

It is now possible, thanks to excellent material of this species at my disposal, to give a fairly complete description of this plant.

A shrub or small tree, 2 meters high, with stout, straight, single spines; leaves simple, glabrous, thick, coriaceous, broadly oval, bluntly pointed at both ends, margins entire or faintly crenulate; leaf-blades 5–7.5 × 3–4 cm.; with 8–11 pairs of lateral veins, arising at an angle of 40° to 60° with the midrib, usually straight but sometimes bending to the right or left to unite with the neighboring lateral vein, tertiary or quaternary veinlets forming coarse, irregular, inconspicuous reticulations; oil glands small, very numerous; petioles cylindrical 3.5–7 × 1–1.5 mm., pulvinoid, minutely puberulous on the upper side inside the shallow channel bounded by the decurrent leaf-margins; inflorescences terminal (sometimes arising on modified spines!), compact, corymbose, with widely divergent, short, stout branches; calyx glabrous within, finely pubescent without, 4–5-lobed, lobes very broad, bluntly pointed, with short-ciliate margins; petals thick, white within, green without in the bud and greenish white when expanded, linear-oblong, blunt-tipped, 10–11 × 3 mm., glabrous except for scattered puberulence near the tip; stamens with glabrous filaments, anthers long and slender with a large dorsal oil-gland; disk cup-shaped 0.5–0.6 mm. high, inclosing loosely the base of the ovary (Plate 1, figure 2); pistil 10–11 mm. long; ovary obovoid, 4.5–5 mm. high, 1.7–2 mm. wide, flattened at top, obscurely furrowed in the middle portion with from 12–20 slight narrow ridges from which arise scattered long hairs in a nearly vertical line, tetragonal or pentagonal at the top because of 4 or 5 large sunken oil-glands (one over each locule); locules 4–5, each with 2 pendant collateral ovules; style about 6 mm. long, 1.8–2 mm. thick, terete, sparingly pilose above, increasingly so toward the base, stigma depressed-capitate, 1.8–2 mm. wide, 0.7–0.8 mm. high, with 4–5 radially arranged linear stylar canals, with 2 (rarely 1) large oil glands between each adjoining pair of stylar canals; fruits subglobose, 37–40 mm. in diam., pericarp thin, dotted with oil-glands, containing very numerous, very slender, fusiform pulp-vesicles 9–11 mm. long, abruptly truncate and 0.5–0.8 mm. in diam. at the base where attached to the dorsal wall of the locule; the broadest portion (1.6–1.8 mm. wide) of the pulp-vesicle is located about 1/10–

1/6 of the distance from the base to the slender apical portion, often matted and tangled in dried specimens; seeds large, long-obovate, 17–18 × 9–11 × 3.5 mm., with a smooth, firm, yellowish gray testa, mono-embryonic; cotyledons green, gland-dotted.

TYPE: East Indies, Java, on strand near Rembang, *J. E. Teysmann, no number* (Rijks Herbarium, Leiden, sheet no. 925,250–602, flowers lacking, 1 fruit seen and studied; photostat of entire sheet and photographs of fruit and foliage also 15 serial microtome sections of fruit [S. and T. no. 547 A, slides 1, 2, 3] filed in Herb. National Arboretum, Washington).

COTYPE: Java, Rembang, *J. E. Teysmann* (Rijks Herbarium, Leiden, sheet with Tanaka's identification label "R.841"; not seen, photograph of part of this sheet by T. Tanaka [no. 3813] in Herb. National Arboretum).

OTHER MATERIAL: Buitenzorg, Java, Collector ? *"ex herb. hort. bot. bog. III. G. 3. 1903."* (Herb. Bur. Sci. Manila, fruiting branch; photostat of sheet and photographs of details in Herb. National Arboretum). Bali, *collector ?* (Rijks Herbarium, sheet no. 908,203–1384, examined at Leiden; photograph from Rijks Herbarium no. "2.85 — 1912"; in Herb. National Arboretum). French Indo-China, Annam, Nha-trang, *C. B. Robinson no. 1504,* March 11–26, 1911 (Herb. Bureau Science, Manila; photostat and photographs in Herb. National Arboretum). Annam, Nha-trang, *Aug. Chevalier no. 30526,* 6/2/1916, fruiting branch (Herb. National Arboretum). Annam, Tourane, *J. and M. S. Clemens nos. 3263 and 3823* (Herb. Arnold Arboretum and National Herbarium, also same numbers in Herb. Bot. Museum, Berlin-Dahlem; all seen and studied, photostats of sheets and detail photographs of leaves, flowers and fruits filed in Herb. National Arboretum).

Limnocitrus littoralis is a striking plant because of its thick, veiny leaves, rigid, straight thorns, abundant clusters of greenish white flowers and fruits that look like small oranges. It is called *kim do um* by the natives at Nha-trang, Annam, and doubtless because of this is not difficult to find in this locality.

Because of its habitat, in tidal marshes subject to recurrent inundations at spring tides, this plant is almost certain to possess a rather high tolerance to salinity in the soil moisture. *Citrus* can be grafted on *Merope angulata,*[1] another salt-tolerant Citrus relative, but so far has made only unsatisfactory growth on this stock. However, *Limnocitrus littoralis* is undoubtedly much more closely related to *Citrus* than is

[1]Swingle, Walter T., Merope angulata, a salt-tolerant plant related to Citrus, from the Malay Archipelago (in Jour. Wash. Acad. Sci. 5: 421–425, 2 figs. 1915).

Merope angulata which is a member of another subtribe, *Triphasiinae*. Another Citrus relative *Eremocitrus glauca*[1] (more closely related to *Citrus* than is *Limnocitrus*) native to more or less saline flats in dry regions of N. E. Australia is salt- and boron-tolerant and supports *Citrus* well when used as a rootstock.

As *Limnocitrus* is easily obtainable, it should be introduced into culture and tested as a root stock for *Citrus*.

THE GENUS WENZELIA

Some 25 years ago Dr. E. D. Merrill founded a new genus, *Wenzelia*, on a single new species, *W. brevipes*, discovered in Leyte, one of the southern islands of the Philippines. In 1928 Tyôzaburô Tanaka transferred *Citrus paludosa* Lauterbach and *C. dolichophylla* Lauterbach & K. Schumann, to the genus *Wenzelia*. In 1938 I also transferred *Citrus grandiflora* Lauterbach to *Wenzelia*. Unfortunately these three species, all native to New Guinea, were, and still are, only imperfectly known and it may prove difficult to secure additional and better material of them from this vast and still only very inadequately explored island.

It is a great pleasure to be able to add to this genus no fewer than five new species, all of them better known than any of the old species except Merrill's type species, *Wenzelia brevipes*. I discovered three of the five new species in herbarium specimens sent to me for study by Dr. Merrill from the rapidly growing collections of the Arnold Arboretum. Dr. Merrill also called to my attention the curious tree discovered by Dr. A. C. Smith in the Fiji Archipelago that proved to be another new species of *Wenzelia*. The type specimen has been lent to me by the New York Botanical Garden.

Finally I am naming, with some hesitation, a new variety of *Wenzelia brevipes*, found on Alabat Island in the Philippines. Thanks to these new discoveries *Wenzelia* is now the largest genus in the southeastern part of the range of the Orange subfamily, from the southern islands of the Philippines to New Guinea, the Solomons and Fiji Archipelago.

It also appears that among the six well-known species of *Wenzelia* there are two well-marked groups of species characterized by two very different types of seeds. One group, typified by the type species of the genus, *Wenzelia brevipes*, has only a few large thick seeds; the other group, not known until I discovered two new species from New Guinea and one from the Solomons, has many seeds (sometimes as many as 30 in a single fruit) which are flattened and often more or less curved or

[1]Swingle, Walter T., Eremocitrus, a new genus of hardy drouth-resistant Citrus fruits from Australia (in Jour. Agr. Res. **2**: 85–100, 7 figs. pl. 8. 1914).

bent by mutual pressure. These flat-seeded species of *Wenzelia* are obviously related to the curious *Monanthocitrus cornuta,* native to southwestern New Guinea. This latter plant belongs to a monotypic genus; it has leaves much like those of *Wenzelia,* but much smaller flowers, and very thin, saucer-shaped seeds covered with small red-brown spots and having thin fimbriate margins. Until the thin-seeded species of *Wenzelia* were discovered, *Monanthocitrus* was one of the most isolated genera of the whole tribe *Citreae.*

The six genera of the Orange subfamily, restricted to the southeastern or Monsoon area are *Clymenia* (Bismarck Archipelago), *Monanthocitrus* (New Guinea), and *Eremocitrus* (N. E. Australia), all three monotypic genera, *Oxanthera* with four species (New Caledonia), *Microcitrus* with six species (N. E. Australia and New Guinea) and *Wenzelia* with nine species (S. Philippines to New Guinea, Solomons and Fiji Archipelago). *Wenzelia* is not only the largest of these six genera, but also the most widely distributed. All of these genera of exclusively southeastern distribution, belong to the tribe *Citreae* which contains 28 genera of which only five genera, *Luvunga* (12 sp.), *Paramignya* (15 sp.), *Citropsis* (11 sp.), *Atalantia* (10 sp.) and *Citrus* (16 sp.) are larger than *Wenzelia.*

A striking proof of the rapid advance of our knowledge of the *Citrus* relatives is furnished by the fact that not a single one of the nine species that now constitute the genus *Wenzelia* had been described up to 1901! The second species was published in 1910, the third in 1915 (when the genus *Wenzelia* was established), a fourth in 1918 and the other five are only now described in this paper.

It is very probable that still more species of *Wenzelia* will be found as New Guinea, Celebes, the Moluccas and the Bismarck Archipelago are more thoroughly explored.

I give without further delay descriptions of the five new species and one new variety of *Wenzelia.*

Wenzelia Archboldiana, sp. nov. PLATE 2, FIGURES 1–5.

Wenzeliae brevipedi affinis sed differt (1) seminibus planis, plus minusve curvatis, in loculis dense confertis et plus minusve deformatis, (2) loculis ovarii ovula 6(–8) gerentibus, (3) fructu oblato-sphaeroideo apice basique depresso, loculis 5 inflatis.

Arbor inermis, 3–5 m. alta; foliis ovato-lanceolatis vel lanceolatis, 16–22 × 7–9 cm., apice plus minusve acutis, basi cuneatis, marginibus integerrimis vel leviter crenulatis, nervis lateralibus utrinque 10–14, sub angulo 60–70° divergentibus; petiolis brevissimis, 4–8 × 1.5–2 mm.;

floribus plerumque 2 in axillis foliorum terminalium; alabastris ante anthesin 23 × 4 mm. (Plate 2, figure 4); pedicellis 4–5 × 0.8 — 1 mm.; calycibus 4–5 mm. longis, apice 3–4 mm. latis, lobis calycis brevibus, 1 × 3 mm., rotundatis, extus et in margine minute pubescentibus; petalis 5 (vel 4), albis, 15 × 4.5 mm. (in alabastro), glandulis oleiferis instructis, glabris, marginibus tenuibus scariosisque; disco brevi cylindrico; basi ovarii isodiametrali, 0.9 mm. alto, 1.7 mm. lato, in stylum subito constricto; loculis ovarii 6- vel 8-ovulatis; stylis cylindricis 4.5 × 0.5–0.6 mm., stigmatibus globoso-depressis, 1 mm. altis, 2 mm. latis; fructibus saepe duobus in axillis foliorum ultimorum, oblato-sphaericis, 2.5–3 × 3–3.5 cm., 5-locularibus, loculis intumescentibus sectionem transversalem stelliformem lobis 5 obtusis formantibus, (Plate 2, figures 1, 2); seminibus pluribus, ad 6 vel 8 (!) in quoque loculo, planis plus minusve curvatis, 15–17 × 10–11 × 1.5–3.5 mm., brunneo-fuscis; embryone unico.

A thornless shrub or small tree, 3–5 m. high; leaves ovate-lanceolate or lanceolate, 16–22 × 7–9 cm., more or less abruptly acuminate at apex, cuneate at base, margins entire or slightly crenulate, lateral veins 10–14 on each side, arising at an angle of 60°–70° with the midrib, petioles very short, 4–8 × 1.5–2 mm. (1/25 to 1/40 of the length of the leaf-blade), flowers usually arising in pairs in the axil of the terminal leaf, flower-buds ready to open 2.3 × 4 mm.; pedicel 4–5 × 0.8–1 mm.; calyx 4–5 mm. long and 3–4 mm. wide at the top, calyx-lobes short (1 mm. long, 3 mm. wide), broadly rounded, minutely pubescent on the back and margin; corolla white, petals 5 (or 4), 15 × 4.5 mm. (in the bud), dotted with oil-glands, glabrous, margins thin and slightly scarious; pistil 12–12.5 mm. long (immediately after the petals fall); disk short, cylindrical, 0.9 mm. high, 1.7 mm. wide, narrowed to 1 mm. at the suddenly constricted junction with the ovary (Plate 2, figure 5); ovary with stalk 6–7 × 3 mm., 5-locular, each locule with 6 (or 8!) collateral ovules, style cylindrical, 4.5–5 × 0.5–0.6 mm., stigma cushion-shaped, 1 mm. high, 2 mm. wide; fruits often paired in the axil of the uppermost leaf of fruiting twig, depressed globose, 2.5–3 cm. high, 3–3.5 cm. wide, 5-locular, locules bulged, making fruit star-shaped in cross section with very blunt, rounded rays (Plate 2, figures 1, 2); seeds several (up to 6 or 8!) crowded into each locule, flat and more or less curved or bent, 15–17 × 10–11 × 1.5–3.5 mm., brownish-gray (after soaking in formaldehyde), mono-embryonic.

TYPE: New Guinea, Papua, Lower Fly River in rain forest, opposite Sturt Island, *L. J. Brass no. 8038*, October 1936, fruiting branch (Herb. Arnold Arboretum, photographs and seeds in Herb. National Arboretum).

OTHER MATERIAL: New Guinea, Morobe District, Ulap, hill forest, alt. 650 meters, *M. S. Clemens no. 6673*, Aug. 3, 1937, flowering twig (Herb. National Arboretum). New Guinea, Morobe District, Sattelberg, hill forest, alt., 1000–1200 meters, *J. and M. S. Clemens no. 1057*, Dec. 3, 1935, branch with very young fruit (Herb. Berlin-Dahlem; photograph in Herb. National Arboretum).

Wenzelia Archboldiana has leaves and flowers much like *W. melanesica* from the Solomon Islands some 2000 kilometers to the east, but has very different oblate-spheroid fruits while those of *W. melanesica* are slender and taper to a sharp apex. On the contrary, *W. Archboldiana* is decidedly different in all its characters of leaf, flowers and fruits from *W. platysperma* which is native to the same part of New Guinea. All three species just named are alike in having flattened, thin-margined seeds.

The two fruits of the type specimen of *Wenzelia Archboldiana* show several, often 5–8, fusiform cracks, 8–12 mm. long and 3–5 mm. wide at their broadest, in the outer pericarp, radiating from the axis at the base and at the tip of the fruit (Plate 2, figure 1). Most of these cracks run along the center of the locule wall but some cracks, usually smaller, radiate along the boundary of two adjacent carpels.

This striking new species has been named in honor of Mr. Richard Archbold who has organized and led three great collecting and exploring expeditions to New Guinea and, by employing expert collectors like L. J. Brass, has brought back many thousands of herbarium specimens representing the remarkably interesting plants of New Guinea.

Wenzelia melanesica, sp. nov. PLATES 2, FIGS. 6–8; 3, FIGS. 1–3.

Wenzeliae Archboldianae proxime affinis, sed differt (1) fructu irregulariter cylindrico, angulis 4–5 instructo, ad apicem elongato-apiculato, (2) seminibus tenuioribus, non deformatis.

Arbor inermis, 7 m. alta; foliis glabris, ellipticis, apice acuminatis, basi rotundatis, margine integerrimis vel paulo crenatis, nervis lateralibus utrinque 12–18, subtus conspicuis, sub angulo lato (70°–80°) divergentibus; petiolis brevissimis, 4–5 mm. longis, 1–1.3 mm. latis, glabris, non articulatis; floribus singulis vel 2–3 in axillis foliorum; pedicellis brevibus (4–6 mm.), bracteis minutis margine ciliatis suffultis; calycibus 4–5-lobatis, lobis rotundatis 1.3–2 × 1.5–2 mm., marginem versus accrescenter pubescentibus, copiose ciliatis; corolla 4–5-mera, petalis albis, staminibus 8–10, ovario 4–5-mero, loculis 6-ovulatis; fructu irregulariter 4–5-angulato, in apicem acutum attenuato (Plate 2, figures 6, 7), 4.5 × 2.3 cm.; pericarpio glandulis oleiferis numerosis minutis (0.1–0.2 mm.), leviter impressis instructo; seminibus tenuibus, planis,

ovatis, 9–13 × 6.5–9 × 1.5–2 mm. (Plate 2, figure 8), fusco-canis, marginibus tenuissimis subintegris, pallidioribus quam seminibus, embryone unico.

A thornless small tree up to 7 m.; leaves glabrous, elliptical, acuminate at the apex, broadly rounded at the base, margins entire or slightly crenulate; lateral veins 12–15 pairs clearly marked below, arising at a large angle (70°–80°) with the midrib; petioles very short, 4–5 × 1–1.3 mm., glabrous, not articulated with the blade; flowers solitary or in small groups (2–3) in the axils of the leaves (Plate 3, figure 3); pedicels short (4–6 mm.), with very small ciliate bracts at the base, expanding gradually into the funnel-shaped calyx; calyx 4–5-lobed, lobes broadly rounded or very bluntly pointed 1.3–2 mm. long, 1.5–2 mm. wide and increasingly short-pubescent toward the margins which are abundantly short-ciliate; corolla with 4–5 petals (immature in type specimen); stamens 8–10; pistil immature; ovary with 4–5 locules, each with 6 ovules; fruits irregularly 4–5-angled, tapering to a sharp point at the apex (Plate 2, figures 7, 8), 4.5 cm. long, 2.3 cm. wide, the pericarp showing numerous, evenly distributed, small (0.1–0.2 mm.) slightly sunken oil-glands; seeds thin, flat or nearly so, ovate in outline, 9–13 × 6.5–9 × 1.5–2 mm., dusky gray, very thin at the edges, with a lighter colored, narrow, usually subentire, marginal membrane; embryo monoembryonic.

TYPE: Solomon Islands, Bougainville Island, Buin, Kugu-maru, *S. F. Kajewski no. 1907 a*, rain-forest, alt. 150 meters, 2/7/30, fruiting twig (Herb. Arnold Arboretum, photographs and seeds in Herb. National Arboretum).

COTYPE: Same locality, *S. F. Kajewski no. 1907 b*, twig with young flower-buds (photographs and serial microtome sections of young flower-buds, S. and T. no. 352 A, slides 1 to 5; 352 B, 1, 2; 640 A, 1 to 5 [802 transverse sections]; no. 640 B, 1 to 3 [83 longitudinal sections] in Herb. National Arboretum). This cotype is mounted on the same sheet with the type specimen.

This species at first glance resembles *W. Archboldiana* except that the leaves are narrower and longer and acuminate at the tips. The fruits are entirely different being irregularly 5- or 4-angled, blunt at the base but sharply pointed at the apex.

The mature fruits with ripe seeds of the type specimen were preserved in formaldehyde solution, then dried and attached to the herbarium sheet. These fruits contained nothing but the dry thin flat seeds, almost light enough to be blown by the wind. It is always possible that these fruits which were cut partly open and preserved in formaldehyde

solution may have contained mucilaginous matter which was dissolved by the preserving fluid.

Wenzelia platysperma, sp. nov. PLATE 3, FIGURES 4, 5.

Wenzeliae Archboldianae affinis sed differt (1) foliis angustioribus, apice acuminatis vel caudatis, marginibus irregulariter crenulatis, (2) fructu pendante singulo, subgloboso vel ovato, roseo ex axillis foliorum longe pedicellato, (3) seminibus tenuioribus non deformatis.

Arbor frutexve inermis, 3 m. alta; ramulis junioribus gracilibus, saepe ad nodos alternatim dextrorsum sinistrorsumque deflectis (modo zigzag), internodiis circa 3 cm. longis; foliis elongato-ellipticis, 10–20 × 2.5–5.5 cm., apice acuminatis vel caudatis, basi cuneatis vel rotundatis, margine irregulariter crenulatis (Plate 3, figure 4) vel denticulatis (*Brass no. 7025*); nervis lateralibus utrinque 12–14, sub angulo 70°–80° divergentibus; petiolis brevissimis, 3–4 mm. longis; floribus ignotis, sed calycis lobis ad basim fructus persistentibus, rotundatis, 2 × 2 mm., minute puberulis vel glabrescentibus (Brass no. 7025); fructu subgloboso, 4 × 3.5 cm., vel ovato, 4.8 × 3.5 (Brass 7025), roseo vel puniceo, semper (?) 4-loculari; pedicellis longis et gracilibus ex axillis foliorum ultimorum assurgentibus et pendentibus; seminibus pallide brunneis, 12–15 × 7–9 × 2–3 mm., applanatis, testa margine rugosa vel in membranam tenuem plus minusve laceratam producta; embryone unico, cotyledonibus viridibus.

A thornless tree, 3 m. high; internodes 3 cm. long, often bent slightly at each node alternately to the right and left; leaves chartaceous, elongate-elliptical, 10–20 × 2.5–5.5 cm., acuminate or caudate at apex, cuneate or broadly rounded at base, margins irregularly crenulate (Plate 3, figure 4) or denticulate (in Brass no. 7025), lateral veins 12–14 on each side, arising at an angle of 70°–80° with the midrib; petioles very short, 3–4 × 1.4–1.8 mm. (1/40 to 1/60 of the length of the leaf-blade); flowers not seen, calyx persistent, subtending the fruit, deeply lobed, lobes 2 × 2 mm., broadly rounded, minutely puberulent or glabrous; fruits reddish or pink, subglobose 4 × 3.5 cm., or ovate, 4.8 × 3.5 cm. (in Brass no. 7025) 4-locular (?), borne singly on a slender pedicel 10–12 mm. long, arising in the axil of the uppermost leaf; seeds flattened, light-brown, 12–15 × 7–9 × 2–3 mm., testa rugose on edges or else tapering into thin irregularly shaped extensions with somewhat torn margins, mono-embryonic, cotyledons greenish.

TYPE: New Guinea, Papua, Palmer River, 2 miles below junction with Black River, flood plain forest undergrowth, alt. 100 m., *L. J. Brass*

no. 7111, June 1926, fruiting branch (Herb. Arnold Arboretum; photograph and seeds in Herb. National Arboretum).

COTYPE: Same locality, ridge forest undergrowth, alt. 100 m., L. J. *Brass no. 7025,* June 1936, fruiting branch (Herb. Arnold Arboretum; photograph and seeds in Herb. National Arboretum).

This curious species is known only from the type collections, both made in the same region. These two type specimens show small differences possibly due, in part at least, to the slightly different ecologic environment as no. 7111, the type, was growing in the flood plain and no. 7025 on a ridge.

Wenzelia platysperma is distinguished clearly from all other species of the genus by its slender, elliptical, apiculate or caudate leaves, zigzag internodes and pendant, rose-colored or pink, apparently terminal fruits which are in reality borne singly on a long pedicel arising in the axil of the uppermost leaf on the fruiting branch.

Wenzelia kambarae, sp. nov. PLATE 3, FIGURES 6–8.

Wenzeliae brevipedi proxime affinis sed differt (1) fructu majore sphaerico, (2) seminibus majoribus et praesertim crassioribus, (3) floribus plerumque singulis e foliorum axillis orientibus, (4) foliis magnitudine magis variabilibus.

Frutex vel arbor inermis, 3–7 m. altus; trunco 4–8 cm. diam., ramulis primo viridibus, cito pallide brunneis; foliis tenuiter chartaceis, oblongis vel elongato-ellipticis, magnitudine multo variabilibus, 6–21 × 3–9 cm. (Plate 3, figures 6 and 7), apice obtuse apiculatis vel rotundatis, basi cuneatis vel rotundatis, margine intergerrimis vel paulo crenatis (Naiau Ins.), nervis lateralibus utrinque 8–13 sub angulo variabili (60°–80°) divergentibus, ascendentibus; petiolis 4–7 × 1.5–2 mm.; alabastris (Naiau Ins.) immaturis, 2.5 × 2 mm.; pedicellis tenuibus 6–9 mm. longis, basi bracteis minutis suffultis; sepalis 3, petalis 3, staminibus 8, ovario (juvenili) 3-loculari; fructu subgloboso, 3–4 cm. diam., aurantiaco; pericarpio leviter glandulis oleiferis instructo; pedicellis 14–16 × 1–1.8 mm., carpophoro inter fructum et calycem 1.2–2.5 mm. longo; seminibus magnis crassisque, ovoideis, 1.8–2.5 × 1.2–1.5 cm., testa levi, nitida, albo-flavida; embryone unico vel binis.

A spineless shrub or small tree 4–7 m. high, trunk 4–8 cm. diam., twigs glabrous, green but soon turning light brown; leaves thin, chartaceous, oblong to elongate-elliptical, varying greatly in size and shape, (Plate 3, figures 6, 7), 6–21 × 3–9 cm., bluntly pointed or rounded at apex, broadly cuneate or rounded at base, margins entire or irregularly and shallowly crenate (Zimmerman's Naiau material), lateral veins

8–13 on each side, arising at rather widely varying angles (60°–80°) with the midrib, petioles 5–7 × 1.5–2 mm., tapering; flower buds (Zimmerman's Naiau material) very young, 2.5 × 2 mm., borne on slender pedicels 8–9 mm. long (Plate 3, figure 6), with several minute pointed bracts on the lower portion; fruits orange-colored, 3–4 cm. diam., 3- (or ?4-)locular with a gland-dotted but smooth pericarp, borne on pedicels 14–16 × 1–1.8 mm., with a cylindrical carpophore 1.2–2.5 mm. long between the persistent calyx and the base of the fruit; seeds very large and thick, ovoid, 1.8–2.5 × 1.2–1.5 mm., testa smooth, shiny, cream-colored; embryos 1 or 2 (sometimes more?), greenish colored.

TYPE: Fiji Archipelago, Kambara Isl., *A. C. Smith no. 1265,* Mar. 2–7, 1934, fruiting branch (Herb. New York Botanical Garden; photographs in Herb. National Arboretum).

COTYPE: Same locality and date, *A. C. Smith no. 1293,* fruiting branch (Herb. New York Botanical Garden; photographs in Herb. National Arboretum).

OTHER MATERIAL: Fiji Archipelago, Naiau Island, *E. C. Zimmerman,* Aug. 22, 1938, leafy twigs with young flower-buds, also material in alcohol, (Herb. National Arboretum; photographs in Herb. Arnold Arboretum; also serial microtome sections S. and T. no. 398 A, slides 1–4, and 398 B, 1–4 [518 cross sections]; 398 C, 1–2 and 398 D, 1–2 [140 longitudinal sections] in Herb. National Arboretum).

Dr. A. C. Smith[1] discovered this plant on Kambara Island and gives the native name *moli-moli,* apparently a reduplication of the name *moli* commonly used in Polynesia for the orange, perhaps because the fruits of *Wenzelia* have, when ripe, the color and odor of *Citrus.* Dr. Smith has given me much help in the study of this species.

This species is the easternmost large-seeded *Citrus* relative that occurs on the islands of the Pacific. Its seeds are so large that it is improbable that they would have been carried to Fiji by birds especially since the fruits contain no pulp and little if any mucilaginous matter. It is highly probable that the *moli moli* reached the Fiji Archipelago from the center of origin (probably New Guinea) of the genus *Wenzelia* by slowly spreading eastward over dry land, a migration that would probably have required millions of years to accomplish.

Dr. Edward C. Zimmerman of the Bishop Museum at Honolulu, who made possible the identification of this plant, obtained flower buds by "shooting" the dangerous surf on the atoll surrounding Naiau island.

[1]Smith, Albert C., Fijian plant studies (Bishop Mus. Bull. 141: 1–160, illus. 1936).

He wrote me that the natives of the Lau group know the plant well by the name *moli moli* and that they told him there were "both pink and red flowers" (perhaps in different stages of development although all other *Wenzelia* flowers, so far observed, are white). The trees on Naiau island were taller (5–7 m.) than those reported from Kambara island (3 m.) but the leaves of the Naiau plants were all smaller (6–10 × 2.5–5 cm.) than the larger ones from Kambara (A. C. Smith no. 1265) (11.5–21 × 4–8.5 cm.). However, another collection from Kambara island (A. C. Smith no. 1293) shows smaller leaves 8–12 × 2.5–5 cm. *Wenzelia kambarae* is doubtless a variable species showing many forms.

Wenzelia tenuifolia, sp. nov.

Wenzeliae brevipedi affine sed differt (1) foliis tenuissimis, apice rotundatis, saepe irregulariter emarginatis, (2) fructu ovoideo nec obovoideo, (3) seminibus magnis, ovatis, plus minusve cuneatis, margine integerrimis, crassis.

Differt a *Wenzelia platysperma* et aliis speciebus subgeneris *Papualimonis* margine seminis integro crasso nec membranaceo tenui laciniato.

Frutex inermis, 2 m. altus, ramulis ultimis gracilibus, 1.1–1.8 mm. diam., internodiis 2–3, raro 5 cm. longis; foliis tenuissimis, in sicco fragilibus, apice irregulariter rotundatis, saepe plus minusve emarginatis, basi cuneatis, nervis lateralibus utrinque 10–12, sub angulo variabili (65°–80°) divergentibus; petiolis brevibus, gracilibus, 4–6 × 1–1.1 mm.; fructu ovoideo, 3.5 × 3 cm., 5-loculari, seminibus 1–4 in quoque loculo, brunneo-fuscis, ovatis, 17–19 × 12–15 × 3.5–5 mm., compressis (in sectione plus minusve cuneatis), saepe margine integris, 1–2 × 1–1.5 mm., crassis vel paulo marginatis, embryone unico.

A spineless shrub, 2 m. high, ultimate branches slender, 1.1–1.8 mm., internodes 2–3 (rarely 5 cm.) long; leaves very thin, brittle when dry, more or less broadly elliptical, 10–13 cm. long including the petiole, 5–7.2 cm. wide, apex bluntly rounded and often imperfectly developed, the very tip being stunted, broadly cuneate at the base and more or less torn, sometimes more or less irregularly emarginate; margins entire, lateral veins 10–12 pairs arising at angles of 65°–80° with the midrib; petioles 4–6 × 1–1.1 mm.; fruit ovoid, 3.5 cm. long × 3 cm. broad, 5-loculate, radial locule walls thin, 1–1.5 mm. thick but expanding into a thick rib of tissue running longitudinally in the fruit; more or less triangular in cross section, 4–7 mm. in radial thickness, dorsal locule walls only 1–2 mm. thick midway between the radial walls; seeds dull brown, ovate, compressed, 17–19 × 12–15 × 3.5–5 mm., more or less wedge-shaped, with a faintly more or less concentrically marked and

corrugated edge, 1–2.2 mm. wide, and 0.5–1.5 mm. thick, on one side of the seed, 1–4 in a locule, often occurring in closely approximated pairs; embryo mono-embryonic.

TYPE: Southeastern New Guinea, Papua, Boridi, forest alt. c[irca]. 4000 [or 11000] feet, *C. E. Carr no. 14881*, 2 branches, 1 fruit, Feb. 1, 1935 (Herb. Berlin-Dahlem; photographs and serial microtome sections, S. and T. no. 666 A, slides 1–8, 666 B, 1–4 (24 cross sections of 1 mature fruit); 666 C, 1–3; 666 D, 1–4 (42 cross sections of 2 mature seeds) Herb. National Arboretum).

This species is known to me only from the rather scanty type specimen, but it is so evidently distinct from all the other known species that I have no hesitation in making it a new species.

It is somewhat of a connecting link between the two subgenera *Euwenzelia* and *Papualimo* but apparently falls in *Euwenzelia* as the seeds lack the paper-thin more or less torn membrane along the free margins of the seeds found in the species of the section *Papualimo*.

The fruits of *W. tenuifolia* are circular in cross section and show five more or less triangular peripheral ribs at the distal ends of the radial locule walls, which fill the spaces between the strongly bulged dorsal locule walls. In striking contrast to this species, *W. Archboldiana* has fruits which are bluntly star-shaped in cross section because of the absence of any tissues filling the inter-locular furrows.

The collector's label on the type specimen is a carbon copy (the original label was doubtless used for another specimen of the plant). The altitude given on the label of the type specimen apparently reads "altitude c. 11000 feet" but may possibly be "c. 4000 feet." If the altitude is 4000 feet (1220 meters) it would be far above the upper limit for the Aurantioid plants in New Guinea (about 300 meters, 914 ft.). If the altitude is 11000 feet (3353 meters) it would equal the highest altitude as yet reported for any Rutaceous plants from New Guinea.[1]

As all the other species of *Wenzelia* grow at low altitudes in tropical regions it will be of interest to learn more about the distribution of *Wenzelia tenuifolia*. Perhaps its curious unusually thin leaves may be adapted for growth in very humid locations such as occur in the cloud belts of mountains.

[1]LAUTERBACH, C., Die Rutaceen Papuasiens (Bot. Jahrb. 55: 221–223. 1918) gives the *Aurantioideae* as having an altitudinal limit of about 300 meters in New Guinea, but reports that several genera of the *Toddalioideae* and *Xanthoxyleae* are found growing in cloud and fog belts of the mountains at 800–1500 meters altitude and that 3 species of *Acronychia* occur at altitudes from 2700 to 3300 meters.

Wenzelia brevipes Merrill var. **alabatensis**, var. nov.

A typo differt foliis angustioribus glandulis oleiferis paucioribus et inconspicuis instructis.

Leaves long and narrow, 22–28.5 cm. long and 5–6.6 cm. wide, narrowed toward the base, then bluntly rounded. Oil-glands smaller, slightly less numerous and decidedly less conspicuous, especially on the under surface of the leaf.

TYPE: Philippines, Alabát Island (lat. 14° 10′ N., 121° 55′ E.), *M. Ramos and G. Edaño, Bureau of Science 48054*, Sept. Oct. 1926, fruiting twig (Herb. Univ. California, sheet 322,000; photographs and a leaf in Herb. National Arboretum).

This variety is known only from the type collection. It is possible that this extremely narrow-leaved form may be found to intergrade with the species but as yet such intergradations are not in evidence. It is the most northern form known.

TWO SUBGENERA IN WENZELIA

The seven species of Wenzelia that are well known, fall into two groups having very different seeds.

1. EUWENZELIA, subgen. nov.

   Seminibus crassis, plus minusve applanatis, numquam tenuiter marginatis.

   Wenzelia brevipes Merrill (type of subgenus)
   W. tenuifolia Swingle
   W. kambarae Swingle

2. PAPUALIMO, subgen. nov.

   Seminibus tenuibus applanatis, plus minusve tenuiter laciniato-marginatis.

   Wenzelia platysperma Swingle (type of subgenus)
   W. paludosa (Lauterbach) Tanaka
   W. melanesica Swingle
   W. Archboldiana Swingle

It is possible that intergrading forms between these two subgenera may be found when the seeds of the two older species from New Guinea are known.

Doubtless the three species, *Wenzelia brevipes*, *W. tenuifolia* and *W. kambarae*, that constitute the subgenus *Euwenzelia* are relics of the remote ancestral type of *Wenzelia*. Two of these species are the most widely separated in space of any, *W. brevipes* in the Southern Philippines

and *W. kambarae* in the easternmost Lau Islands of the Fiji Archipelago, about 12,500 kilometers distant!

These three species probably represent ancient ancestral types of the genus *Wenzelia,* while the flat-seeded species found in New Guinea and the Solomon Islands doubtless rapidly evolved there into the subgenus *Papualimo.*

A NEW SPECIES OF PARAMIGNYA

Paramignya is the second largest genus of the tribe CITREAE and the largest in the subtribe TRIPHASIINAE. It is closely allied to *Luvunga,* another large genus with 12 species. Both of these genera include woody lianas that climb to the tops of tall forest trees, hanging on to them by means of their stout retrorse and often recurved spines that are borne singly in the axils of the leaves. *Paramignya* has 1-foliolate leaves with pulvinate petioles that enable them to turn to face the light. *Luvunga* has 3-foliolate leaves borne on long straight petioles pulvinate at the base. Both genera are native to southeastern Asia and the East Indian Archipelago from Sumatra and the Philippines to New Guinea.

The 12 typical species of *Paramignya* constitute a remarkably uniform group and are evidently closely related to each other. Among the many very interesting plants collected in the island of Hainan by American and Chinese botanists and collectors is a species of *Paramignya* of which abundant herbarium specimens are available for study. This species proves to be a new one.

Paramignya confertifolia, sp. nov. PLATE 4, FIGURES 1, 2.

Paramignyae Surasianae Craib et *Paramignyae rectispinosae* Craib affinis sed differt (1) internodiis brevioribus saepe brevissimis, (2) spinis brevioribus vel deficientibus, (3) petiolis saepe brevioribus. A *Paramignya longipedunculata* Merr. differt pistillis multo brevioribus et ab aliis speciebus typicis Asiaticis *Paramignyae* ovariis brevissimis (1.2–2.3 mm.), quam stylo circiter quater brevioribus.

Frutex scandens; internodiis ramulorum juniorum robustiorum 2–3 cm. longis, sed eis ramulorum fructiferorum multo brevioribus (plerisque 8–10 mm. longis); spinis brevibus, 3–10 mm. (plerisque 3–6 mm.) longis, recurvatis; foliis ovatis vel oblongis vel oblongo-ellipticis, basi plerumque rotundatis (in foliis longis aliquando cuneatis), apice acuminatis rotundatis, costa media et 8–12 nervorum paribus utrinque conspicuis sed subtus distinctioribus; margine integris vel irregulariter et tenuiter crenulatis; petiolis 4–12 × 1–1.5 mm., supra planis plus minusve pubescentibus, in sicco rugosis, parte pulvinoidea cum lamina non articulata;

floribus axillaribus, singulis vel pluribus, parvis, aliquando in racemis valde reductis; alabastris cylindricis, 8–10 × 2.5–3.5 mm.; pedicellis brunneo-fuscis gracilibus, 4–5 × 0.5–0.7 mm., glabris, bracteis minutis sparse hirsutis suffultis; pedunculis hirsutis; calycibus parvis, 2 × 1–5 mm., brunneo-fuscis, lobis 5 triangularibus, apice ciliatis; petalis 5 glabris, in vivo albis, brunneo-flavis in sicco, 7–9 vel 10 × 3–4 mm.; staminibus 10, filamentis applanatis, 5–6 mm. longis, antheris linearibus 1.8–2 mm., disco cylindrico non latiore quam basi ovarii; ovario ovoideo, 1.1–1.3 × 1 mm., valde hirsuto (pilis flavo-brunneis), 4–5 loculare, loculis uni-ovulatis apice abrupte contracte in stylum sparse hirsutum vel glabrum, 5–6 × 0.3–0.4 mm., ad basim paulo latiorem et supra graciliorem, post anthesin cito caducum; stigmate depresso-globoso, 0.5 mm. × 1–1.5 mm., (Plate 4, figure 2); fructu 1.5–2 cm. diam., subgloboso, primo glabro, maturo rugosissimo, pericarpio sulcis irregularibus instructo et fere lobato, glandulis oleiferis magnis impressis instructo; seminibus parvis, ovoideis, embryone unico.

A climbing shrub, 3–5 meters high, clambering over shrubs; young twigs with internodes 2–3 cm. long on vigorous shoots, but on fruiting branches much shorter, often only 8–10 mm. long, spines short, 3–10 mm. long (usually 3–6 mm.), recurved; leaves oval or oblong to long-elliptical, usually broadly rounded at the base (sometimes cuneate on longer leaves), acuminate at the tip, the very tip of the acumen bluntly rounded; midrib, and the 8–12 or more pairs of lateral veins visible on both surfaces but more distinct below; margins entire or irregularly and shallowly crenulate; petioles 4–12 × 1–1.5 mm., flattened above, more or less pubescent, wrinkled in dried specimens, pulvinoid portion not articulated; flowers axillary, arising singly or in small clusters, sometimes in greatly reduced racemes; flower-buds cylindrical, 8–10 × 2.5–3.5 mm.; pedicels slender, 4–5 mm. long, 0.5–0.7 mm. wide, glabrous, subtended by minute sparsely hirsute bracts where the pedicels join the hirsute peduncles; calyx small, 2 mm. wide, 1–5 mm. high, brownish buff colored as is the pedicel; calyx-lobes 5, triangular, with ciliate tips; petals 5, glabrous, white when fresh, yellowish brown when dry, 7–9 or 10 × 3–4 mm.; stamens 10, filaments flattened, 5–6 mm. long, anthers linear, 1.8–2 mm. long; disk cylindrical not broader than the base of the ovary; ovary ovoid, 1.1–1.3 × 1 mm., strongly hirsute with yellowish buff hairs, with 4 or 5 1-ovulate locules, narrowed abruptly into the sparsely hirsute or glabrous style, 5–6 mm. long, 0.3–0.4 mm. wide, slightly broader at base and more slender above, deciduous shortly after the flowers open; stigma depressed-globose, 0.5 mm. high and 1–1.5 mm. wide; fruits at first subglobose, glabrous, but when full sized becoming

very rough, sometimes almost lobed with irregularly rugose folds of the pericarp that shows numerous large sunken oil glands, 1.5–2 cm. diam.; seeds small, ovoid, mono-embryonic.

TYPE: China, Hainan Island, Naam Shan leng, *Lau no. 339,* July 30, 1932, flowering branch (Herb. National Arboretum, also serial microtome sections, S. and T. no. 290 A, slides 1–8 [440 transverse sections of 1 flower]).

COTYPE 1: China, Hainan, San Tsuen Mountain, *Tsang Wai Tak, C.C.C. no. 15523,* July 15, 1927, flowering branch (Herb. Univ. Calif., Berkeley, sheet 315941; photographs and serial microtome sections S. and T., 92 A, slides 1–7; 92 B, 1–10; 199 A, 1–9; 199 B, 1–8 [2003 transverse sections of flower bud]; 92 C, 1–4; 199 C, 1–2; 199 D, 1, 2 [204 longitudinal sections of 1 flower bud and of 1 pistil] in Herb. National Arboretum).

COTYPE 2: China, Hainan Island, Nodoa, *Woon Young Chun,* fruiting branch (Herb. Univ. Calif., sheet 236165; photographs and serial microtome sections, S. and T., 495, slides 1–4 [6 transverse sections of 1 nearly mature fruit] in Herb. National Arboretum).

This interesting species is found abundantly in the Island of Hainan clambering over shrubs and small trees. It has been identified wrongly with *P. scandens* Craib but in reality is much more nearly related to two new species recently described from Siam by Craib: *P. Surasiana* and *P. rectispinosa.* Both of these last named species and *P. confertifolia* from Hainan agree in having a very short ovary scarcely more than 1 mm. long with a style 4–5 times as long. The other species of *Paramignya* native in southeastern Asia have much larger ovaries, usually several mm. tall and the style is only 3 or 4 times as long as the ovary.

The Philippine species, *P. longipedunculata* Merr., also has a very short ovary (about 1.5 mm.) with a very long style (about 15 mm.) which is nearly as wide as the ovary and not clearly delimited from it. However, this Philippine species differs widely in many other characters from *P. confertifolia* and is not closely related to it.

The fruits of this species are very peculiar; as they ripen they become exceedingly irregular in shape, rough and wrinkled. Upon sectioning, the pericarp is found to be of unusual thickness and to be filled with a multitude of large and small oil glands. No other species of the Orange subfamily yet discovered has so striking a development of oil glands in a soft and spongy pericarp.

A NEW SPECIES OF ATALANTIA

Professor E. D. Merrill kindly sent me for examination a new species

of *Atalantia* named by him and Professor Chun. By his permission I am including it here; it is a very curious species as will appear later.

Atalantia hainanensis Merrill et Chun in herb., sp. nov.

PLATE 4, FIGURES 3–7.

Atalantiae ceylanicae remote affinis sed differt (1) fructu ellipsoideo nec sphaerico cum stylo plus minusve persistente, vesiculis pulpiferis paucissimis vel deficientibus, (2) foliis magnitudine variabilissimis, apicibus acutis vel paulo acuminatis, (3) disco cupulari, (4) ovario 2-loculari.

Frutex parvus, 2 m. altus; ramulis junioribus leviter angulosis, demum teretibus; foliis simplicibus, crassis, coriaceis, ellipticis vel late ellipticis, apice paulo acuminatis vel obtusis, saepe emarginatis, basi cuneatis, sensim in petiolum attenuatis, magnitudine variabilissimis, plerumque 6–16 cm. × 2.5–6 cm. petiolo incluso, sed aliquando 19.5 × 7.5 cm., aliquando 2.5 × 0.8 cm., margine integerrimis vel leviter crenulatis; petiolis 5–10 cm. longis, plus minusve pulvinoideis nec cum lamina articulatis; inflorescentiis axillaribus brevibus, 1–1.5 cm. longis, in racemis pauciflori; alabastris parvis, 3–3.5 mm. longis, 2–2.5 mm. latis; sepalis 5, triangularibus, crassis, tota superficie, margine tenui ciliata excepta, glandulis oleiferis asperata; petalis 5, albis; staminibus 10, filamentis crassis, basi connatis, supra liberis, antheris glandula oleifera singula in connectivo instructis; ovario parvo, 1.5 × 1 mm., ovoideo, 2-loculari, ovulis 2 collateralibus in quoque loculo, supra utrumque loculum una glandula oleifera magna instructo; stylo gracili, 1.5 × 0.3–0.4 mm., stigmate fere quam stylo isodiametrico, duobus paribus glandularum oleiferum instructo; disco cupulari, circa 0.35 mm. alto, glabro, 2/5 ovarii inferioris cingente; fructibus (novellis) ellipsoideis, 8–10 × 4–5 mm., pericarpio viridi, numerosis glandulis et stylo parvo persistente 1 × 0.6 mm. instructo; semine singulo, 8 × 4.5 × 3.5 mm., in quoque fructu (vel pluria?); embryone unico; cotyledonibus glandulis oleiferis numerosis instructis.

A small spineless shrub, 1–2 m. high; young twigs slightly angled but soon becoming cylindrical; leaves simple, persistent, thick and coriaceous, elliptical or broadly elliptical, slightly acuminate or bluntly pointed at the tip, often emarginate, cuneate at the base, narrowing gradually into the petiole very variable in size, usually 6–15 × 2.5–6 cm., sometimes as large as 19.5 × 7.5 cm. and sometimes as small as 2.5 × 0.8 cm. inclusive of the petiole, margins entire or faintly undulate; petiole not articulated with the leaf blade, 5–10 mm. long, more or less pulvinoid; inflorescences axillary, short (1–1.5 cm. long), racemose,

few-flowered; pedicels slender, 2–3 × 1 mm.; flowers small, 3–3.5 mm. long, 2–2.5 mm. wide; calyx with 5 triangular thickened lobes, roughened with oil-glands except at the thin and ciliate margins; petals 5, white; stamens 10, filaments flattened, connate at the base, free above, anthers with 1 large oil-gland in the connective; ovary small, 1.5 × 1 mm., ovoid, with 2 locules, each with 2 collateral ovules, top of ovary with 1 large oil-gland above each locule; style slender, 1.25 × 0.3–0.4 mm., stigma nearly isodiametric with the style, with 2 pairs of large oil-glands; disk cupulate, about 0.35 mm. deep, glabrous, completely surrounding the basal 2/5 of the ovary; fruits (young) ellipsoid, 8–10 × 4–5 mm.; pericarp green, with numerous oil-glands, surmounted by the small persistent style, 1 × 0.6–0.7 mm.; seeds 1 (or more?) to a fruit, large, ellipsoid, about 10 × 7 × 5 mm., mono-embryonic, cotyledons with numerous oil-glands.

TYPE: China, Hainan Island, Po Ting, *F. C. How no. 72807,* in forest, near stream, alt. 300 meters, June 12, 1935, flowering branch (Herb. Arnold Arboretum; photographs and serial microtome sections S. and T. no. 261 A, slides 1–6; 261 B, 1–4 [534 transverse sections of 2 flower buds], 261 C, slides 1–2 [48 longitudinal sections of a flower bud] also 1 leaf and 1 fruit in Herb. National Arboretum).

COTYPE 1: Type locality; *F. C. How no. 73976,* fruiting branch, Nov. 3, 1935 (Herb. Arnold Arboretum; photographs and serial microtome sections, S. and T. no. 263 A, slides 1–3, and 263 B, 1–3 [186 transverse sections of 2 fruits] also 1 leaf and 1 fruit in Herb. National Arboretum).

COTYPE 2: Type locality; *F. C. How no. 73068,* flowering branch, July 4, 1935 (Herb. Arnold Arboretum; photographs and serial microtome sections, S. and T. no. 262 A, 1 slide [39 longitudinal sections of a young flower bud] also 1 leaf in Herb. National Arboretum).

OTHER MATERIAL: Type locality, *F. C. How no. 73718,* fruiting branch, Sept. 25, 1935; Type locality, *F. C. How no. 72461,* small-leaved branch with very young fruits; Type locality, *F. C. How no. 73207,* very large-leaved flowering branch, July 17, 1935; China, Hainan Island, Yaichow, alt. 100 meters; *N. K. Chun and C. L. Tso, no. 44603,* fruiting branch (?), Dec. 1932 (Herb. Arnold Arboretum).

This curious plant, clearly a very distinct new species, is hard to place in the absence of mature fruits. It has leaves varying greatly in size (2.5–19.5 × 0.8–7.5 cm.) having much the general aspect as those of *Severinia buxifolia* Ten. which species it also resembles in having a cupular disk and a 2-loculate ovary. However, the serial microtome sections made of the immature fruits of the cotype (How 73976) do not

show a clear-cut inner layer of stalkless subglobose pulp-vesicles lining the walls of the locule but rather large and variable-sized oil-glands (?) that are not in a definite layer lining the walls but scattered between the much smaller oil-glands of the pericarp and the inner wall of the locule. Study of the fruits of this species at all stages of development may show that these structures have a merely superficial resemblance and no true homology with the primitive pulp-vesicles of *Severinia buxifolia* and other typical species of *Severinia*. The typical species of *Atalantia* have sessile, broad-based, conical pulp-vesicles growing out from the dorsal locule walls and, with the seeds, filling the locules completely. However, *Atalantia ceylanica* (Arn.) Oliver, the type-species of the subgenus *Rissoa*, shows in the mature fruit very few pulp-vesicles, perhaps because the very large seeds almost completely fill the locules. This species like *Atalantia hainanensis*, has a cup-shaped disk fitting closely around the base of the ovary. *Atalantia Guillaumini* Swingle, an anomalous species of which only the very large subglobose, fully mature fruits are known, does not seem to have any pulp-vesicles among the very large seeds.

Study of more complete material of *A. Guillaumini* and *A. hainanensis* may show them both to be aberrant species of *Severinia* rather than of *Atalantia*.

EXPLANATION OF PLATES

PLATE 1

Limnocitrus littoralis (Miquel) Swingle. Figure 4, type specimen in Rijks Herb. Leiden. Figures 1, 2, 3, 6, Clemens no. 3263, Tourane, Annam, in Herb. Arnold Arboretum. Figure 5, Chevalier no. 30526, Nha-trang, Annam, in Herb. National Arboretum.

Figure 1. Flowering twigs. Nat. size.

Figure 2. Serial microtome sections of pedicels, calyx, disk and pistil. × 4.

Figure 3. Cross section of flower bud. × 8.

Figure 4. Cross section of immature fruit from type specimen. × 4.

Figure 5. Cross section of nearly ripe fruit. × 6.

Figure 6. Flower buds, and flower after fall of petals. × 4.

PLATE 2

Wenzelia Archboldiana

Figure 1. Leaf and fruits showing fusiform cracks in outer peel. Coll. Brass no. 8038, Lower Fly River, New Guinea. ½ nat. size.

Figure 2. Fruit seen from side. Brass no. 8038. Nat. size.

Figure 3. Fruit in cross section showing an empty locule and 5 of the 8 seeds it contained. Brass no. 8038. ½ nat. size.

Figure 4. Longitudinal section of a flower ready to open. (Coll. Clemens no. 6673, Sattelberg, Morobe Distr., New Guinea). × 3.

Figure 5. More highly magnified view of same flower bud showing disk separated from base of ovary by a slanting constriction. × 11.

Wenzelia melanesica

Figure 6. Twig with leaf and young fruit. (Coll. Kajewski no. 1907[a], Buin, Bougainville Island, Solomons). ½ nat. size.

Figure 7. Dry fruit from Kajewski no. 1907[a]. Nat. size.

Figure 8. Cross section of a 5-locular dry fruit, and flattened seeds. (Kajewski no. 1907[a]). ½ nat. size.

Plate 3

Wenzelia melanesica

Figure 1. Cross section of young flower bud. (Coll. Kajewski no. 1907[b]. Buin, Bougainville Isl., Solomons). × 10.

Figure 2. Longitudinal section of young flower bud. (Kajewski no. 1907[b]). × 10.

Figure 3. Two young flower buds in axil of a leaf. (Kajewski no. 1907[b]). × 2½.

Wenzelia platysperma

Figure 4. Leaf attached to a fruiting branch. (Coll. Brass no. 7111, Fly River Valley, New Guinea, type). ½ nat. size.

Figure 5. Flattened seeds. (Brass no. 7111). ½ nat. size.

Wenzelia kambarae

Figure 6. Young flower buds and small leaves. (Coll. Zimmerman, Naiau Island, Fiji Archipelago). Nat. size.

Figure 7. Fruiting twig with large leaves; and fruit with a plump white seed. (Coll. Smith, Kambara Isl., type). ½ nat. size.

Figure 8. Longitudinal section of flower bud. (Coll. Zimmerman, Naiau Island). × 10.

Plate 4

Paramignya confertifolia

Figures 1 and 2. Type specimen, Hainan Island (Lau 339).

Figure 1. Crowded leaves and flowers. ½ nat. size.

Figure 2. Longitudinal microtome section of pistil. × 11.

Atalantia hainanensis

Figures 3–6. Type specimen, Hainan Island (F. C. How 72807).

Figure 3. Longitudinal section of flower bud showing cupulate disk, oil-gland in anther, etc. ×10.

Figure 4. Cross section of flower bud showing disk surrounding the 2-locular ovary, etc. × 10.

Figure 5. Cross section of flower bud showing tip of ovary with 2 large oil-glands. × 10.

Figure 6. Leaves and flower buds. ½ nat. size.

Figure 7. Cotype specimen (F. C. How 73976). Leaves and young fruits. ½ nat. size.

DIVISION OF PLANT EXPLORATION AND INTRODUCTION,
BUREAU OF PLANT INDUSTRY, U. S. DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.

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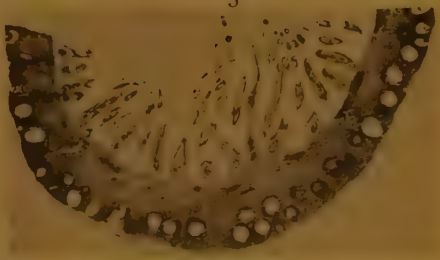

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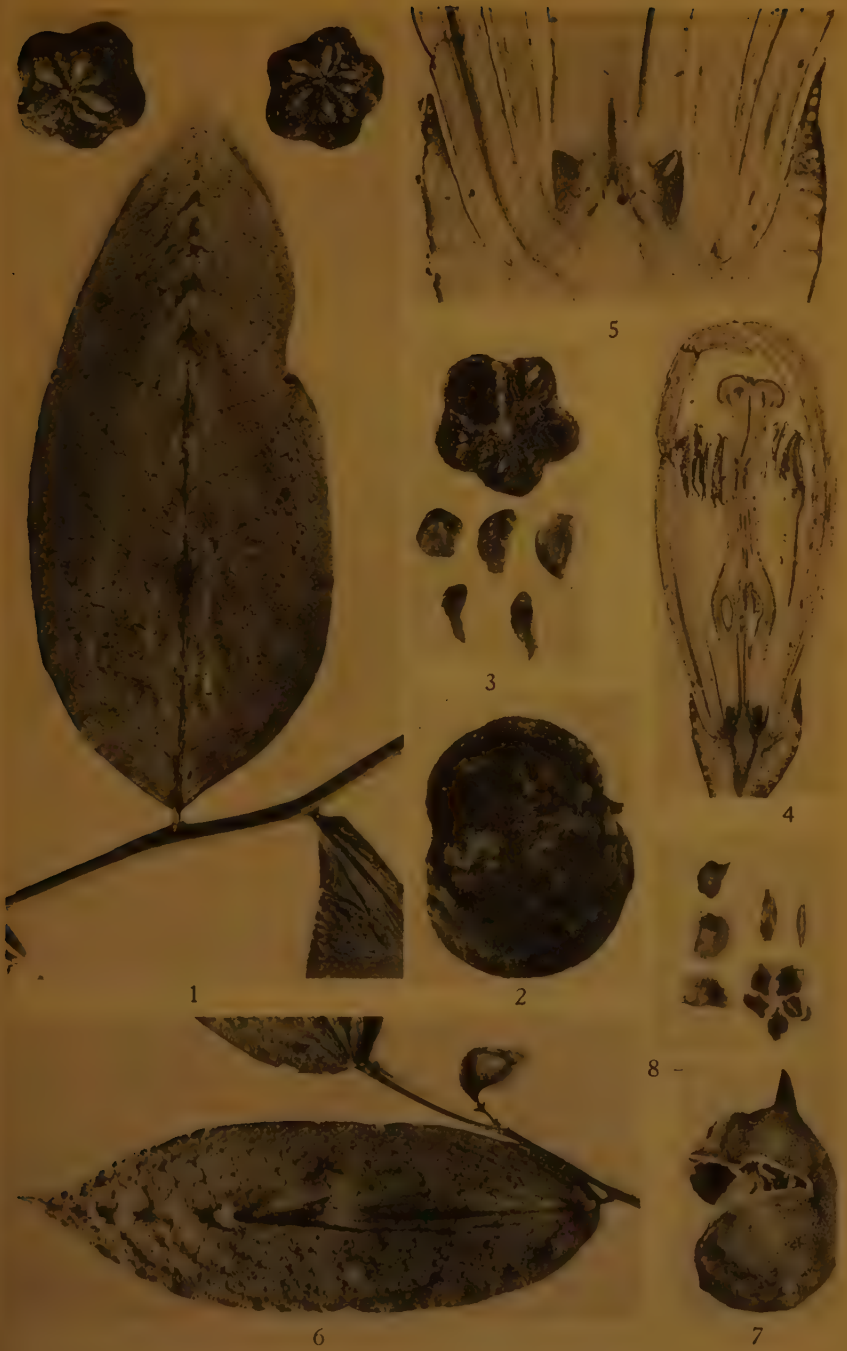
Limnocitrus littoralis (Miq.) Swingle



WENZELIA ARCHBOLDIANA Swingle and W. MELANESICA Swingle

FULL-TONE — MERIDEN

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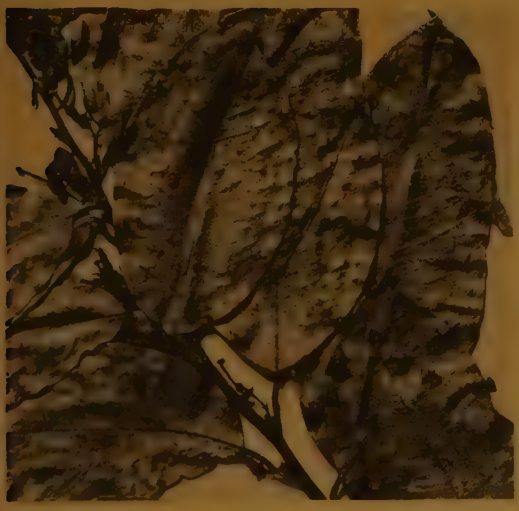
Wenzelia melanesica Swingle, W. platysperma Swingle and W. kambarae Swingle

FULL-TONE — MERIDEN



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PARAMIGNYA CONFERTIFOLIA Swingle and ATALANTIA HAINANENSIS Merrill & Chun ex Swingle

FULL-TONE — MERIDEN

ANTHEROSTELE, GENUS NOVUM RUBIACEARUM UROPHYLLO AFFINE

C. E. B. Bremekamp

In studying the Philippine species of *Urophyllum* Wall. I noticed some plants that attracted my attention by their long-pedicellate flowers arising singly or in groups of three from the axils of the leaves, which is an uncommon feature in this genus. A closer investigation revealed other and more important points of difference: in the first place the presence of small acaridomatia on the under side of the leaves, secondly the presence of an entirely different kind of hairs in the corolla throat and also on the corolla lobes, which should have been glabrous, and thirdly the linear, instead of oblong or ovate, form of the anthers and their cohesion in a cylindrical tube.

Acaridomatia have never been found in the genus *Urophyllum;* in the related genera *Pleiocarpidia* K. Sch. and *Praravinia* Korth. (*Williamsia* Merr.) too they are always absent. The character, though easily overlooked, for the acaridomatia are here as a rule very small, is therefore of great importance.

The hairs in the corolla throat in *Urophyllum* and its allies are a feature of diagnostic value. In all of them they are unicellular and more or less distinctly flattened, but in other respects they differ considerably. In *Urophyllum* itself they are long and rather weak, but nevertheless fairly straight; toward the top they are provided with peculiar one-sided constrictions. In *Pleiocarpidia* they are somewhat shorter and as a rule distinctly twisted; the constrictions are all-sided, deeper and more regularly spaced, and as they start near the base, the hairs may be described as torulose: they can easily be mistaken for septate hairs, but in reality septa are completely absent. The hairs of *Praravinia* are stiff and pointed, and though a few constrictions near the top may be present, the majority of the hairs are always smooth; they are longer and whiter than in the two other genera. In our aberrant species the hairs are also unicellular and slightly flattened, but they are much shorter and distinctly clavate, and constrictions are completely absent. Moreover, they are not confined to the throat, but cover the corolla lobes to the very top, giving them a velvety appearance: the hairs in the throat, however, are somewhat longer than those on the lobes.

Syngenesious anthers, though not unknown in the Rubiaceae (*Argostemma, Neurocalyx, Strumpfia*), are a rather uncommon feature: in *Urophyllum* and its allies they have never before been observed.

In view of these important differences the question arises whether the relationship of these plants with *Urophyllum* and its allies can really be regarded as very near or, at least, as nearer than their affinity to other genera. This, however, can not be doubted, for they agree with *Urophyllum* and its allies in all characters in which the latter agree among each other: they have the same kind of ovary and placentation, the same form of corolla, the same alveolate seeds, and the flowers are in all of them in the same manner differentiated in male flowers with rudimentary pistil and female flowers possessing staminodes provided with fairly large, but completely sterile anthers. As the sterility of the anthers is easily overlooked, the female flowers of *Urophyllum* and its allies have often been mistaken for bisexual ones: a thorough investigation has shown, however, that bisexual flowers in these genera are entirely absent.

As the foregoing considerations lead to the conclusion that the aberrant plants can not be left in *Urophyllum,* and that they can not be referred to any of the allied genera, the creation of a new genus is doubtless justified. In view of the syngenesious anthers I will name it ANTHEROSTELE. The description is based on the common characters of the four species dealt with below.

Antherostele n. gen. *Rubiacearum* inflorescentiis axillaribus dioecis, ovario pluriloculari, corolla hypocrateriformi, fructu carnoso, seminibus permultis alveolatis ad genera *Urophyllum, Pleiocarpidiam, Praraviniam* et alia huius affinitatis loco alio describenda accedens, foliis domatiiferis, corollae fauce et lobis supra velutinis, pilis corollinis late clavatis et levibus, staminibus sub fauce insertis, antheris linearibus syngenesiis ab eis faciliter distinguendum.

Plantae lignosae parvae vel arborescentes, sed trunco semper tenui et ramis paucis divaricatis, semper dioecae. Rami novelli plerumque subquadrangulares. *Folia* opposita, petiolata; petiolus canaliculatus, a latere complanatus, plerumque gracilis; lamina lineari-oblonga, oblonga vel oblongo-elliptica, acuminata vel subcaudata, costa canaliculata, axillis nervorum aliquorum subtus acaridomatiis parvis ore glabris munita. Stipulae interpetiolares, simplices, plerumque satis magnae, margine interdum brevissime ciliatae, colleteris intus ad basim in areolam parvam congestis, axilla pilosae, ceterum glabrae. Inflorescentiae axillares, masculae plerumque triflorae, interdum ad florem

singulum redactae, femineae plerumque uniflorae, interdum triflorae tamen, omnes ad insertionem pedicelli vel pedicellorum involucello tetramero munitae, sessiles vel breviter pedunculatae. Flores longe pedicellati, ebracteolati, normaliter 5-meri. Ovarium floris masculi rudimentarium, floris feminei 5-loculare, placentis axillaribus, ovulis numerosissimis. Calyx cupularis vel campanulatus, subtruncatus vel lobatus, tubo in flore masculo longiore quam in flore femineo. Corolla hypocrateriformis, alba, extus glabra, tubo lobis subaequilongo faucem versus pilis unicellularibus subcomplanatis levibus late clavatis breviter barbato, ceterum glabro, lobis lineari-oblongis acutis, intus omnino indumento e fauce ascendente obtectis et inde velutinis. Stamina et staminodia similiora, dimidio superiore tubi inserta, filamentis brevibus glabris tubo usque ad basim decurrentibus, antheris dorsifixis linearibus, basi bifidis, lobis mucronulatis, connectivo angusto interdum carinato, interdum in apiculam recurvatam exeunte, in tubum cylindricum dimidio superiore e fauce exsertum connatis; antheris staminodiorum minoribus quam staminum, sterilibus. Discus tenuis, margine undulatus, glaber. Stylus floris feminei usque ad medium in stigmata 5 fissus, parte indivisa 10-costata, stigmatibus in capitulum glabrum diu coherentibus, intus carinatis et dense papillosis; stylodium floris masculi tenue, in stigmata rudimentaria dua exeuns. Bacca 5-locularis, calyce coronata. Semina numerosa rubro-brunnea, minute alveolata.

Hab. Insulas Philippinenses.

Species typica: **Antherostele banahaensis** (Elm.), n. comb. = *Urophyllum banahaense* Elm., Leafl. Philip. Bot. 1(3): 70 (1906).

Four species, all endemic to the Philippine Islands, can be referred to the new genus: three of them have originally been described as species of *Urophyllum,* and one is new. Of the latter and of one of the others the flowers are as yet unknown, but in view of the presence of acaridomatia and of their resemblance to the type species, I feel no hesitation in referring them to this genus. The four species may be distinguished by the aid of the following key:

Key to the Species of Antherostele

1. Calyx distinctly lobed. Leaves linear-oblong. Stipules more than 3 cm. long and 1.5 cm. wide. ..... 4. *A. grandistipula* (Merr.) Brem.
1. Calyx subtruncate. Leaves oblong or oblong-elliptic. Stipules less than 1.2 cm. long and 0.8 cm. wide. 2
2. Leaves less than 7 cm. and petioles less than 1.5 cm. long; 6–8 pairs of nerves. .....3. *A. luzoniensis* (Merr.) Brem.

2. Leaves more than 9 cm. and petioles more than 2.5 cm. long; 8–13 pairs of nerves. 3

3. Leaves glossy; the axils of nearly all the nerves with easily visible acaridomatia; reticulation on both sides prominulous. Cork yellowish-brown and nitidulous, not reaching the top of the shoots. ....2. *A. callophylla* Brem.

3. Leaves dull; acaridomatia few and difficult to see; reticulation on the upper side nearly invisible. Cork dull grey, as a rule covering the whole shoot. .....1. *A. banahaensis* (Elm.) Brem.

As the original descriptions of species 1 and 4 were based on fruiting material only, more complete ones will here be given. My wish to produce a set of easily comparable descriptions may excuse the new one of species 3.

1. **Antherostele banahaensis** (Elm.), n. comb.

Urophyllum banahaense Elm., Leafl. Philip. Bot. **1**(3): 70 (1906); Merr., Enum. Philip. Pl. **3**: 522 (1923).

Arbuscula 5–8 m. alta. Rami novelli primum sericeo-villosi, mox glabrescentes, plerumque fere omnino cortice griseo opaco vestiti, obtuse quadrangulares, internodiis haud rare cavis et fissura hiante patentibus. Folia mox omnino glabrescentia, petiolo gracili 3–4 cm. longo; lamina oblonga vel oblongo-elliptica, 11.5–18 cm. longa et 4–5.5 cm. lata, acuminata, basi acuta vel cuneata, subcoriacea, opaca, sicc. supra saturate olivacea vel olivaceo-brunnea, subtus dilute olivacea, costa subtus sicut nervis primum pubescente, nervis utroque latere costae 8–13 subtus prominulis, acaridomatiis paucis et minimis, venulis laxe reticulatis subtus distinguendis. Stipulae oblongae, 10 mm. longae et 4 mm. latae, margine undulato sparse ciliatae, axilla villosae, mox deciduae. Inflorescentiae plerumque axillis foliorum, interdum axillis cicatricum insertae. Flores pedicellis sparse pubescentibus, 10–14 mm. longis elati. Ovarium floris masculi 1 mm. altum; floris feminei ovoideum, 5 mm. altum et 7 mm. diam., subglabrum. Calyx floris masculi cupularis, 8–9 mm. altus et 6–8 mm. diam., margine subintegro, extus sparse pubescens, intus glaber; floris feminei pelviformis, 3 mm. altus et ad orem 8.5 mm. diam. Corolla tubo 12–13 mm. longo et 4 mm. diam., lobis 10 mm. longis et 3 mm. latis, pilis fauce insertis usque ad 1.3 mm. longis, loborum multo brevioribus. Stamina antheris 6.5 mm. longis et 0.7 mm. latis, connectivo dorso carinato et in apiculam recurvatam exeunte; staminodia antheris 3 mm. longis. Stylodium 3.5 mm. longum, puberulum, in lobos 2 lanceolatos fissum; stylus usque ad medium 5-fissus 10 mm. longus, parte indivisa puberula. Bacca obovoidea 8 mm. alta et 6 mm. diam., glabra.

Luzon: Tayabas, Lucban, Mt. Banahao, *Elmer* 7746 (L),[1] ♀, exemplum typi; Lucban, *Elmer* 9188 (A, L), ♂ (co-typus meus); Mt. Binuang, *Ramos & Edaño* B.S. 28604 (A), ♂ buds (shoots abnormally thick and covered with a yellowish-brown instead of grey cortex; leaves very large). Rizal: Mt. Lumutan, *Ramos & Edaño* B.S. 29681 (A), fr. Laguna: Los Baños, Mt. Maquiling, *Elmer* 17484 (A, GH, L, U), ♀ (co-typus meus), 18257 (A, GH, L, U), fr., *Loher* 6387 (K), fr. ("epiphyte"). Sorsogon: Irosin, Mt. Bulusan, *Elmer* 15019 (A, GH, L, U), fr., 15914 (A, GH), (ster.), 16166 (A, L, U), ♀, 17064 (A, GH, L), fr.

In the type locality this species was, according to Elmer l.c., quite common; it occurred in the forest region at an altitude of 1000 m. The label of Loher's specimen records that the plant from which it was taken grew as an "epiphyte," but this was doubtless accidental.

A rather curious feature are the hollow and not rarely somewhat swollen internodes. As the cavities are often, by means of a longitudinal slit, in communication with the world outside, it is not impossible that the plant is a myrmecophyte.

2. **Antherostele callophylla,** n. spec.

Habitus ignotus. Rami novelli glabri, primum complanati et utrimque bisulcati, deinde obtuse quadrangulares, mox cortice luteo-brunneo nitidulo vestiti. Folia glabra, petiolo gracili 2.8–3.3 cm. longo; lamina oblonga, 9.5–13 cm. longa et 3.2–4.7 cm. lata, acuminata, basi acuta, subcoriacea, supra nitida, sicc. supra saturatius et subtus dilute brunnea, nervis utroque latere costae 10–11, acaridomatiis subnumerosis et satis conspicuis, reticulatione subdensa utrimque prominula. Stipulae ovatae, 6–7 mm. longae et 4–5 mm. latae, glabrae, axilla breviter pilosae. Inflorescentiae masculae adhuc ignotae, femineae subsessiles, ad florem singulum redactae, involucello minimo. Flos femineus pedicello glabro, fructigero 1.7–1.8 cm. longo. Calyx annularis, subtruncatus, extus intusque glaber. Corolla ignota. Bacca glabra, calyce 3 mm. alto coronata.

Luzon: Ilocos Norte, Mt. Palimlim, *Ramos* B.S. 33326 (A), typus fr. (distr. sub nomine *Urophyllum bataanense* Elm.).

Now that the importance of the type specimen for the exact definition of a species is generally recognized, there is, as a rule, no excuse for describing new species when the material at hand is incomplete. When,

[1] Editor's Note: The abbreviations of the herbaria cited in this paper are: (A) = Arnold Arboretum; (GH) = Gray Herbarium; (K) = Kew; (L) = Leiden; (U) = Utrecht.

however, the affinity with a well-known species is so unmistakable as that between the plant described above and *A. banahaensis*, and when the species are, at the same time, so easily distinguishable as these two, no objection, I think, can be raised.

3. **Antherostele luzoniensis** (Merr.), n. comb.

Urophyllum luzoniense Merr. in Philip. Jour. Sci. Bot. **12**: 161 (1917), Enum. Philip. Pl. **3**: 523 (1923).

Frutex circ. 2 m. altus. Rami novelli glabri, primum complanati et utrimque bisulcati, deinde subquadrangulares, mox cortice griseo-brunneo, primum nitidulo, deinde opaco vestiti. Folia glabra, petiolo 0.7–1.5 cm. longo; lamina oblongo-elliptica, 3.8–7 cm. longa et 1.8–3.5 cm. lata, acuminata vel caudato-acuminata, basi acuta, subcoriacea vel coriacea, supra nitidula vel utrimque opaca, sicc. supra olivacea, subtus dilute olivacea vel brunnea, nervis utroque latere costae 6–8 subtus prominulis, axillis aliquibus acaridomatiis minimis munita, reticulatione sublaxa nunc subtus solum, nunc utrimque prominula. Stipulae ovatae, 6–7 mm. longae lataeque, margine minutissime ciliatae, axilla brevissime pilosae. Inflorescentiae masculae adhuc ignotae, femineae ad florem singulum redactae, subsessiles vel pedunculo usque ad 10 mm. longo elatae, involucello parvo. Flos femineus pedicello gracili, fructigero 1.2–2.0 cm. longo. Calyx subtruncatus, extus intusque glaber. Corolla ignota. Bacca globosa 1 cm. diam., glabra, calyce 1.8 mm. alto coronata.

LUZON: Tayabas, Mt. Dingalan, *Ramos & Edaño* B.S. 26522 (A), numerus typi, fr.; — Isabela, Mt. Moises, *Ramos & Edaño* B.S. 47319 (A), fr. (shoots somewhat thinner and leaves larger and less coriaceous than in the type number).

4. **Antherostele grandistipula** (Merr.), n. comb.

Urophyllum grandistipulum Merr. in Philip. Jour. Sci. Bot. **8**: 61 (1913), Enum. Philip. Pl. **3**: 522 (1923).

Arbor circ. 8 m. alta. Rami novelli glabri, primum complanati, deinde subteretes, opaci, tarde cortice levi luteolo vel dilute brunneo vestiti. Folia glabra, petiolo gracili, 2.5–5 cm. longo; lamina lineari-oblonga, 12–17 cm. longa et 2.5–4.5 cm. lata, apicem versus attenuata vel subcaudata, basi acuta, subcoriacea, opaca, sicc. dilute olivacea, nervis utroque latere costae 10–20 subtus prominulis, acaridomatiis paucis et minimis, venulis subdense reticulatis. Stipulae obovatae 3–3.5 cm. longae et 1.6–2.0 cm. latae, glabrae, axilla villosae, haud tarde deciduae. Inflorescentiae axillis foliorum insertae, pedunculo 4–8 mm. longo elatae. Involucellum glabrum vel sparsissime ciliatum e squamis lanceolatis 3–5

mm. longis compositum. Flores pedicellis 6–12 mm. longis, glabris, masculi soli noti. Ovarium floris masculi 0.6 mm. altum. Calyx floris masculi campanulatus, extus intusque glaber, tubo 7 mm. alto et 6 mm. diam., pariete crassa, lobis ovato-triangularibus 2 mm. longis et 3.5 mm. latis. Corolla (nondum plane matura) tubo cylindrico 6 mm. longo et 2.5 mm. diam., lobis 7 mm. longis et 2.3 mm. latis, pilis fauce insertis usque ad 0.7 mm. longis. Stamina antheris 6 mm. longis et 0.6 mm. latis, connectivo angustissimo dorso prominente sed haud carinato et vix apiculato. Stylodium 5 mm. longum et 0.4 mm. diam., puberulum, tertia parte superiore in lobos lanceolatos duos divisa. Bacca globosa, 2 cm. diam., glabra, calyce subinfundibuliformi 10 mm. alto, usque ad medium in lobos ovato-triangulares fisso coronata.

LEYTE: Mountains near Dagami, *Ramos* B.S. 15372, TYPUS, fr., nondum vidi; Cabalian, *Ramos* B.S. 41474 (A), fr. SAMAR: Catubig River, *Ramos* B.S. 30504 (A), fr., *Ramos & Edaño* B.S. 75444 (U), fr. MINDORO: fide Merr., Enum. l.c. LUZON: Camarines, *Sulit* B.S. 30316 (A), ♂ (co-typus meus).

BOTANICAL MUSEUM,
UTRECHT.

A PRELIMINARY ACCOUNT OF THE PHILIPPINE SPECIES OF UROPHYLLUM WALL., PLEIOCARPIDIA K. SCH. AND PRARAVINIA KORTH. (RUB.)

C. E. B. Bremekamp

Urophyllum Wall., *Pleiocarpidia* K. Sch., *Praravinia* Korth. and *Antherostele* Brem. form, together with some small and as yet undescribed genera occurring in the Malay Peninsula, Sumatra and Borneo, a well defined group. In the classification of the Rubiaceae worked out by Bentham and Hooker, and accepted with slight modifications by Schumann in the "Natürliche Pflanzenfamilien," they would fall in the Mussaendeae. The delimitation of this tribe, however, is unsatisfactory: on the one hand it is not sufficiently distinguished from the Hedyotideae (Oldenlandieae in Schumann's classification), while on the other hand its constituents show such divergent characters, for instance in the nature of the placentation and of the seed, that they can not be regarded as sufficiently related. The only difference between the Hedyotideae and the Mussaendeae lies in the dry or fleshy consistency of the pericarp, and as there is very often no clear correlation between the consistency of the latter and the morphological differentiation of the ovary, but little value can be attached to this distinction, and it is certainly no wonder that it has never been rigorously applied. Still it is somewhat surprising that both by Bentham and Hooker and by Schumann species with drupaceous fruits (*Metabolos* Bl.) have been referred to the type genus of the tribe with dry fruits. For a better classification our knowledge is, however, as yet too incomplete.

The characters of the small group to which our four genera belong are: the large number of ovoid alveolate seeds; the paired axile placentas; and the valvate aestivation of the corolla lobes. Other characters are the axillary inflorescences; the simple interpetiolar stipules; and the indehiscent fruits with their fleshy pericarp and large ramified placentas; and finally, the insertion of the stamens in the upper part of the corolla-tube or in the throat, and the decurrence of the filaments to the base of the tube; the dioeciousness, and the differentiation of the flowers in male flowers with a rudimentary style and female flowers with staminodes provided with completely sterile anthers, but as a rule only slightly reduced in size; the insertion of stamens and staminodes at the same height; the

presence of flattened hairs in the corolla throat; and the pluri-locular ovary. The first-named characters are those found in the greater part of the Hedyotideae and Mussaendeae; the second set are found also in groups related to the one with which we are dealing; and the last may be regarded as the diagnostic features of the group itself.

For the identification of the four genera represented in the Philippine flora the following key may be used:

Key to the Genera

1. Leaves with small acaridomatia. Corolla lobes inside densely covered with clavate hairs; hairs in the throat similar, but larger. Anthers linear, syngenesious. .....4. *Antherostele* Brem.
1. Acaridomatia entirely absent. Corolla lobes inside glabrous or with a few pointed hairs at the base or at the top; hairs in the throat never clavate. Anthers ovate or oblong, never syngenesious. 2
2. Corolla with a larger number of segments than the calyx. Corolla throat with a dense beard of stiff and pointed, glossy-white hairs. Inflorescences sessile or subsessile, often reduced to a single flower; the flowers also sessile or subsessile. .....3. *Praravinia* Korth.
2. Corolla with the same number of segments as the calyx. Corolla throat bearded, but the hairs neither stiff nor glossy-white. Inflorescences sessile, subsessile or pedunculate, sometimes reduced to a single flower; flowers always pedicellate. 3
3. Inflorescences trichotomously corymbose or paniculate. Hairs in the corolla throat moniliform from the base. Style branches thick, short and truncate, rectangularly spreading and cohering in a thick, centrally depressed disc ("peltate stigma"). .... 2. *Pleiocarpidia* K. Sch.
3. Inflorescences consisting of a terminal umbel and a whorl of flowers separated from the umbel by an internode of varying length; the whorl sometimes reduced or absent; if entirely absent, then the umbel not rarely sessile or subsessile, and sometimes reduced to a single flower. Hairs in the corolla throat with a few irregularly spaced one-sided constrictions near the top. Style branches erect or ascending, acute or obtuse, but never truncate, and never cohering in a thick disc. .....3. *Urophyllum* Wall.

The characters of *Antherostele* have been discussed already in the preceding paper, and at the same place due attention was given to the diagnostic value of the hairs in the corolla throat.

The heteromery between calyx and corolla is confined to *Praravinia*. Though this character has been ascribed to several species of *Urophyllum* (a New-Guinean species even owes its name to it), I have found these allegations everywhere erroneous. As the calyx, however, is very often subtruncate, the number of segments is not always easily ascertainable, and occasionally, moreover, a few irregularities may occur. That the

number of stamens in *Praravinia* should be double the number of corolla lobes, as stated in the original description, is entirely erroneous: a reinvestigation of the type specimen has shown that there is a regular alternation between the stamens and the corolla lobes. The mistake in the original description, though probably a mere slip of the pen, has unfortunately caused a great deal of confusion: on account of this supposed heteromery *Praravinia* was made by Miquel the type genus of a new family; and the genus *Williamsia* was created by Merrill, because in his plants he had looked in vain for the second series of stamens.

The original description of *Pleiocarpidia* (*Aulacodiscus* Hook. f. non Ehrenb.) is also misleading. In the specimens of the type species *Pl. enneandra* (Wight) K. Sch. which I could investigate I found always 7 corolla lobes, 7 stamens and 7 carpels, and though 8-merous and even 9-merous flowers may occur, the number certainly does not vary between 8 and 16. In the various Sumatran and Bornean species which are to be referred to this genus the number varies between 5 and 7. The really distinctive characters are to be looked for elsewhere, namely in the form of the inflorescence, in the nature of the hairs in the corolla throat, and in the way in which the thick and truncate style branches cohere in a thick disc ("peltate stigma").

The delimitation of *Urophyllum* offers more difficulties than that of the other genera, and in order that a satisfactory definition may be arrived at, several species will have to be removed to new genera. This applies even to *U. villosum* Wall., the first of Jack's two species published by Wallich in the first edition of Roxburgh's Flora Indica. At first sight this seems impossible, for according to the International Rules of Nomenclature this species should be regarded as the type species. In my opinion, however, neither *U. villosum* nor *U. glabrum*, the second of Jack's species published by Wallich, can be regarded as the type. The first species belonging to this circle of affinity and recognized as generically distinct from all other rubiaceous plants known at that moment was the plant described in 1823 by Blume under the name *Wallichia arborea* Reinw. ex Bl. The name *Wallichia* could not be retained, for it had been used already in 1819 by Roxburgh for another genus; for this reason Blume changed it in 1826 in *Axanthes* and a few years later, because *Axanthes* is a word of hybrid origin, in *Maschalanthe*. The latter is an illegitimate name, and needs therefore no further consideration. *Axanthes* was rejected in 1851 by Korthals, who was of opinion that Blume's genus was indistinguishable from *Urophyllum* Wall., published in 1824. If Korthals was right in reducing *Axanthes* to *Urophyllum*, Blume's species should, in my opinion, be accepted as the type, for it

was the first that was recognized as generically distinct. One might argue, however, that Korthals was wrong, because there is no general agreement between the two genera, but only between Blume's genus and the second of Wallich's species. We should not forget, however, that Korthals himself was doubtless convinced that the agreement was complete, and that but one genus ought to be recognized; and from that moment, it seems to me, Blume's species became the type to which the name *Urophyllum* was bound. This connection can not be severed for the benefit of another generic delimitation: new genera split off from the old one should get new names and other type species. In this case it is also the most practical solution of the difficulty, because in this way the name *Urophyllum* is retained for the largest number of species. Among the latter are those described as occurring in the Philippine Islands, at least for so far as they have not been removed here to the genera *Praravinia* and *Antherostele*.

The Philippine species of *Urophyllum* are difficult to classify, but this is merely due to the fact that they are as yet still imperfectly known: the majority have been described from fruiting material, and even now flowers are but rarely found in the available material. Among the specimens which I have studied I have seen several undescribed species, but as none of them were provided with flowers, I have refrained from describing them. The Philippine botanists, who doubtless have more complete material at their disposal, are in a better position to do this. The species which have been previously described may be recognized by the aid of the following key.

Key to the Philippine Species of Urophyllum

1. Inflorescences distinctly pedunculate, i.e. peduncle nearly as long as or longer than the pedicels; sometimes distinctly shorter, but then the rhachis of the inflorescence of about the same length as the pedicels. 2
1. Inflorescences sessile or shortly pedunculate, but the peduncles always shorter than the pedicels; rhachis always rudimentary. 8
2. Inflorescence with two involucels, one at the base and the other at the top of the rhachis. Stipules linear. 3
2. Inflorescence with a single involucel; flowers in a triad or umbellate. Stipules ovate-triangular. 5
3. Leaves with 7 pairs of nerves; all or nearly all more than 10 cm. long. ..... 1. *U. memecyloides.*
3. Leaves with 5 pairs of nerves; always shorter than 10 cm. 4
4. Leaves less than 2 cm. wide, linear-oblong. Female flowers in triads. Scales of the involucels not more than 1 mm. long... 2. *U. urdanetense.*

4. Leaves more than 2 cm. wide, oblong. Female flowers solitary. Scales of the involucels in most inflorescences more than 1 mm. long. ....3. *U. caudatum.*
5. Leaves oblong-elliptic and provided with 12 pairs of nerves. ....4. *U. elliptifolium.*
5. Leaves narrower and with less than 10 pairs of nerves. 6
6. Pedicels pubescent. Calyx distinctly lobed and pubescent. Young leaves villous, older ones glabrescent. .....5. *U. subglabrum.*
6. Pedicels glabrous or subglabrous. Calyx truncate and glabrous. Young leaves glabrous. 7
7. Leaves with 8–9 pairs of nerves; the latter like the midrib on the lower side reddish. Reticulation dense and below very conspicuous..... .....6. *U. reticulatum.*
7. Leaves with 7 pairs of nerves, and neither the latter nor the midrib reddish beneath. Reticulation hardly conspicuous, lax. ....7. *U. spec. adhuc indescr.*
8. Leaves with 15–17 pairs of nerves. Inflorescences with more than a dozen long-pedicellate flowers. .....8. *U. platyphyllum.*
8. Leaves with fewer nerves and inflorescences with fewer flowers. 9
9. Stipules narrowly linear, inside glabrous. Leaves linear or linear-oblong. .....9. *U. acuminatissimum.*
9. Stipules less narrow, inside densely villous. Leaves wider. 10
10. Stipules not more than 5 mm. long. Calyx lobes acuminate. ....10. *U. mindorense.*
10. Stipules much longer. Calyx lobes not acuminate. 11
11. Stipules at least three times as long as wide and but little wider than the shoots. Flowers short-pedicellate. .....11. *U. panayense.*
11. Stipules but little longer than wide, much wider than the shoots. Flowers long pedicellate. 12
12. Shoots in herbarium material green. Leaves oblong, with 8–9 pairs of nerves. Stipules 1–1.5 cm. long. .....12. *U. bataanense.*
12. Shoots in herbarium material yellowish. Leaves oblong-elliptic, with 10–11 pairs of nerves. Stipules 2 cm. long. .....13. *U. leytense.*

1. **Urophyllum memecyloides** (Presl) Rolfe in Jour. Bot. **23**: 213 (1885); Vidal, Phan. Cuming. Philip. 119 (1885), Rev. Pl. Vasc. Filip. 152 (1886).

Cymelonema memecyloides Presl, Epim. 210 (1851); Walp. Ann. **3**: 890 (1853).

Urophyllum glabrum Jack apud Merr. in Philip. Bureau Forestry Bull. **1**: 53 (1903), apud Elm. Leafl. Philip. Bot. **1**: 39 (1906), apud Merr. in Philip. Jour. Sci. Bot. **2**: 305 (1907); non Wall. in Roxb. Fl. Ind. **2**: 186 (1824).

Urophyllum arboreum (Reinw. ex Bl.) Korth. apud C. B. Robinson in Philip. Jour. Sci. Bot. **6**: 227 (1911), apud Merr., Enum. Philip. Pl. **3**: 521 (1923); non Korth. in Ned. Kruidk. Arch. **2**: 194 (1851).

Throughout the Philippine Islands, but not yet known from elsewhere.

The type specimen was collected in Samar, and described by Presl as belonging in the Melastomaceae. A second specimen found in the same island by Cuming (v. inf.) was identified by Rolfe, who transferred Presl's species to *Urophyllum*. Afterwards it was reduced first to *U. glabrum* Wall. and then to *U. arboreum* (Reinw. ex Bl.) Korth. From the latter it differs in the larger size of the leaves, the smaller stipules, the somewhat fewer flowered inflorescences, the 6- instead of 5-merous corolla, and above all in the presence of a complete ring of white hairs in the corolla throat: in Reinwardt's species the hairs are yellow, and they are arranged in fascicles surrounding the anthers and separated from each other by wide gaps. *U. glabrum* is a species of somewhat dubious identity: the description seems to point to the plant now known as *U. longifolium* Wight or a nearly related species, and in this way it was interpreted by Kurz in his "Burmese Flora." The description, as we now know, was drawn up by Jack and published by Wallich, but whether or not the latter was acquainted with Jack's type, is unknown: the specimens in the Wallich Herbarium, however, belong to the species for which the name has been used by all subsequent authors, Kurz alone excepted. Descriptions of this species have been given by Hooker f., King and Gamble, and Ridley. It differs from *U. memecyloides* in the smaller size of the leaves, the subglabrous stipules, the smaller and 5-merous flowers, and the imperfect ring of hairs in the corolla throat. *U. glabrum* appears to be confined to the Malay Peninsula, *U. arboreum* to Sumatra and Java, whereas in Borneo nearly related species occur, of which one has been described by Miquel under the name *U. micranthum*.

The material here referred to *U. memecyloides* consists mainly of fruiting branches, but as the most important characters in this group of species are found in the arrangement and color of the hairs in the corolla throat and the degree of reduction shown by the staminodes, it is not impossible that more than one species may be represented. On the whole, however, the material is fairly uniform.

The following specimens were studied:

LUZON. Rizal: Mt. Irig, *Ramos B.S. 41895* (A, L),[1] fr. Laguna: Paete, *Ramos B.S. 10041* (L), fr.; San Antonio, *Ramos B.S. 23817* (L), fr.; Cavinti, *Amarillas B.S. 25801* (GH), ♂; *Canicosa B.S. 29459* (A), ♂. Tayabas: Lucban, *Elmer 4144* (A), ♀, *7598* (A), fr., *7638* (L), ♀ buds; Mt. Binuang, *Ramos & Edaño B.S.*

[1] EDITOR'S NOTE: In the citation of specimens, the following abbreviations for herbaria are used. (A) = Arnold Arboretum; (GH) = Gray Herbarium; (K) = Kew; (L) = Leiden; (NY) = New York; (U) = Utrecht.

28703 (A) (young buds); Infanta-Siniloan Trail, *Ramos & Edaño B.S. 29199* (GH), ♀. Camarines: Maagnas, *Robinson B.S. 6339* (L), fr. MINDORO: Mt. Halcon, *Ramos & Edaño B.S. 40579* (A), fr. CATANDUANES: *Ramos B.S. 30508* (A), fr. SAMAR: without locality, *Cuming 1768* (L), ♂; Catubig River, *Ramos B.S. 24287* (GH), fr., *B.S. 24326* (A), fr.; *Edaño B.S. 24889* (GH), fr. LEYTE: Mt. Abucayan, *Edaño B.S. 41787* (A), fr.; without locality, *Wenzel 85* (A, GH), fr., *529* (A), fr., *539* (GH), fr., *658* (A), ♂. NEGROS ORIENTAL: Cuernos Mts., Dumaguete, *Elmer 9440* (A, L), ♀. PANAY: Capiz, Mt. Madiaan, *Ramos & Edaño B.S. 30645* (GH), fr. MINDANAO. Surigao: *Wenzel 2866* (A), ♂, *2629* (A), ♀; *Ramos & Pascasio B.S. 34546* (L), fr. Bukidnon: Mt. Dumalucpihan, *Ramos & Edaño B.S. 38989* (A), ♂. Zamboanga: Malangas, *Ramos & Edaño B.S. 36877* (A), fr. Agusan: Cabadbaran, *Elmer 14155* (A), fr.

2. **Urophyllum urdanetense** Elm., Leafl. Philip. Bot. **5:** 1900 (1913); Merr., Enum. Philip. Pl. **3:** 524 (1923).

MINDANAO: Agusan, Cabadbaran, Mt. Urdanete, *Elmer 13788* (A, L), fr., exempla typi.

Known from the type locality only, where it occurred at an altitude of 1500–1650 m. Very near to the preceding species but imperfectly described. Nearly related, but apparently distinct from the two preceding species is a plant collected on Mt. Daho in Jolo [*Ramos & Edaño B.S. 4391* (L), ♂].

3. **Urophyllum caudatum** Merr. in Philip. Jour. Sci. **7:** 481 (1920), Enum. Philip. Pl. **3:** 522 (1923).

LUZON: Ilocos Norte, Mt. Palimlim, *Ramos B.S. 33348* (A), fr., exemplum typi.

Known from one locality only.

4. **Urophyllum elliptifolium** Merr. in Philip. Jour. Sci. Bot. **5:** 247 (1910); Elm., Leafl. Philip. Bot. **3:** 998 (1911); Merr., Enum. Philip. Pl. **3:** 522 (1923).

PALAWAN: Mt. Pulgar, *Curran, F. B. 3871,* fr. typus, nondum vidi.

Merrill compares this species with the Bornean *U. subanurum* Stapf.

5. **Urophyllum subglabrum** Merr. in Philip. Jour. Sci. Bot. **12:** 162 (1917), Enum. Philip. Pl. **3:** 523 (1923).

LUZON: Nueva Ecija, Mt. Umingan, *Ramos & Edaño B.S. 26507* (A), fr., exemplum typi; Rizal, Mt. Irig, *Ramos B.S. 41960* (A, L), ♀ buds.

6. **Urophyllum reticulatum** Elm., Leafl. Philip. Bot. **3:** 999 (1911); Merr., Enum. Philip. Pl. **3:** 523 (1923).

SIBUYAN: Capiz, Magallanes, Mt. Giting-Giting, *Elmer 12506* (A, GH, L), fr. exempla typi.

7. **Urophyllum** spec. aff. **reticulatum.**

PANAY: Capiz, Jamindan, *Ramos & Edaño B.S. 31165* (A), fr., B.S. 31000 (L), (buds).

This is doubtless a good species, but as flowers are not available to me I have refrained from giving it a name.

8. **Urophyllum platyphyllum** Elm., Leafl. Philip. Bot. **3:** 999 (1911); Merr., Enum. Philip. Pl. **3:** 523 (1923).

SIBUYAN: Capiz, Magallanes, Mt. Giting-Giting, *Elmer 12363* (A, GH, L), fr., exempla typi.

Apparently related to *U. macrophyllum* (Bl.) Korth., but still imperfectly known.

9. **Urophyllum acuminatissimum** Merr. in Philip. Jour. Sci. Bot. **10:** 106 (1915), Enum. Philip. Pl. **3:** 521 (1923).

LUZON: Laguna, San Antonio, *Ramos B.S. 15012* (L), fr.; *Mabesa B.S. 26791* (A), fr.; Tayabas, *Curran B.S. 13084* (L), fr.; Sorsogon, *Ramos B.S. 23551* (A), fr.; Camarines, Paracale, *Ramos & Edaño B.S. 33764* (L), fr.

An easily recognizable species, of which the flowers are still unknown.

10. **Urophyllum mindorense** Merr. in Philip. Jour. Sci. **20:** 464 (1922), Enum. Philip. Pl. **3:** 523 (1923).

MINDORO: Mt. Calavite, *Ramos B.S. 39379* (A), ♀, exemplum typi, *B.S. 39398* (A) (young buds).

The majority of the specimens hitherto referred to *U. bataanense* Elm. will have to find a place in the neighborhood of *U. mindorense*: their stipules are longer than those of the latter, but much narrower than those of *U. bataanense*. The specimens available to me were all fruiting ones, but even so it was easy to see that they belonged to at least two different species.

11. **Urophyllum panayense** Merr. in Philip. Jour. Sci. **17:** 482 (1920), Enum. Philip. Pl. **3:** 523 (1923).

PANAY: Capiz, Jamindan, *Ramos & Edaño B.S. 31318* (A), ♀, (corollas shed), *B.S. 31421* (A), (young buds), exemplum typi, *B.S. 31105* (A), (buds), *B.S. 30821* (A), (buds); Mt. Macosolen, *Ramos & Edaño B.S. 30819* (L) ♀.

12. **Urophyllum bataanense** Elm., Leafl. Philip. Bot. **1**: 40 (1906); Merr. in Philip. Jour. Sci. Suppl. **1**: 129 (1906), Enum. Philip. Pl. **3**: 522 (1923), p.p.; non Merr. in Philip. Jour. Sci. Bot. **2**: 305 (1907).

LUZON: Bataan, Mt. Mariveles, alt. 1200 m., *Williams 407* (HG), fr.

I have not seen the type of this species, but of all the specimens which I have examined the one quoted above alone answers the description: those collected in other parts of Luzon, and in Mindoro, Bohol and Jolo belong, in my opinion, in the neighborhood of *U. mindorense*. The difference between the true *U. bataanense* and the next species on the other hand appears to be very small, and it is not impossible that further study will reveal their identity: as the type specimens were not at my disposition, I must leave the decision to the Philippine botanists.

13. **Urophyllum leytense** Merr. in Philip. Jour. Sci. Bot. **8**: 62 (1913), Enum. Philip. Pl. **3**: 522 (1923).

LEYTE: Mountains back of Dagami, *Ramos B.S. 15289*, typus, nondum vidi; Cabalian, *Ramos B.S. 41546* (A), fr., *B.S. 41573* (A, L), fr., *Wenzel 569* (A), fr. NEGROS ORIENTAL: Cuernos Mts., Dumaguete, *Elmer 9550* (A, L), ♀ (corollas shed); *Herre 1132* (A), fr.

A nearly related, as yet undescribed, species was collected in Mindoro [Pinamalayan, *Ramos B.S. 40963* (A), ♀; Mt. Halcon, *Ramos & Edaño B.S. 40595* (A), young buds].

Apart from the species enumerated above there are two more that deserve our attention. The first is *Urophyllum halconense* Merr. in sched., easily distinguishable from all other species found in the Philippine Islands by its hairy shoots and leaves and its solitary, long-pedicellate, hairy berries. It was collected on Mt. Halcon, Mindoro (*Ramos & Edaño B.S. 40707* [A], fr., *B.S. 40603* [A], ster.).

The other is a very curious plant with solitary subsessile flowers, provided with a 6-merous calyx and corolla and surrounded by a fairly large involucel; the buds are too young for a good description. It was found at Pinamalayan, Mindoro (*Ramos B.S. 40885* et *41022* [A, L], ♂).

The genus *Pleiocarpidia* is represented by a single species:

1. **Pleiocarpidia lanaensis** Merr. in Philip. Jour. Sci. **20**: 462 (1922), Enum. Philip. Pl. **3**: 524 (1923).

MINDANAO: Lanao, *Mrs. Clemens 882*, typus, nondum vidi; Zamboanga, Malangas, *Ramos & Edaño B.S. 37226* (NY), ♀; *Merrill 8098* (L), (buds); Bukidnon, Mt. Candoon, *Ramos & Edaño B.S. 38988* (NY), fr.

Pleiocarpidia lanaensis comes very near to a species found in British North Borneo and formerly regarded as identical with *Pl. enneandra* (Wight) K. Sch. [cf. Merrill in Univ. Cal. Publ. Bot. **15:** 282 (1929)]. Ridley [Jour. Bot. **70:** 193 (1932)] criticized this identification, expressing his conviction that it was an undescribed species. I am of the same opinion, and I will describe it, in a paper dealing with the genus *Pleiocarpidia* in the Malay Archipelago, under the name *Pl. sandahanica*. Both *Pl. lanaensis* and *Pl. sandahanica* are easily distinguishable from *Pl. enneandra* by the 5- or 6-merous flowers. *Pleiocarpidia lanaensis* differs from *Pl. sandahanica* in the puberous shoots and petioles, the pubescence of the midrib above, the broader, not scaphoid stipules, and the smaller size of the flowers and especially of the staminodes. The hairs in the corolla throat are shorter and show as a rule but four constrictions: they give therefore the impression of being 5-celled.

With regard to the Philippine representatives of *Praravinia* we experience the same difficulty as with those of *Urophyllum*: here too the majority of the descriptions have been based on fruiting material only. Apart from *Pr. triflora* Quisumb. et Merr. and *Pr. pubescens* Quisumb. et Merr. the species, however, are very similar, and probably all nearly related. A glance at the key, by the aid of which the 19 Philippine species can be identified, will give an impression of the differences between them. Six out of these 19 were up to now included in *Urophyllum*.

Key to the Philippine Species of Praravinia

1. Calyx lobes less than twice as long as wide. 2
1. Calyx lobes several times longer than wide. 18
2. Stipules always shorter than the internodes. 3
2. Stipules in the upper part of the shoots as long as or longer than the internodes. 16
3. Shoots and petioles either glabrous or pubescent, but not densely covered with long spreading hairs. 4
3. Shoots and petioles densely covered with long spreading hairs. 15
4. Leaves less than 6 cm. long. 5
4. Leaves more than 6 cm. long. 6
5. Leaves with 5–7 pairs of nerves; midrib and nerves beneath densely and softly pubescent. ..... 1. *Pr. microphylla.*
5. Leaves with 7–8 pairs of nerves; midrib and nerves beneath sparingly and shortly pubescent. ..... 2. *Pr. acuminata.*
6. Flowers distinctly pedicellate 7
6. Flowers subsessile or sessile 8

7. Shoots and petioles sparsely pubescent; ovary subglabrous. ..... 3. *Pr. viridescens.*
7. Shoots, petioles and ovary densely pubescent. . . 4. *Pr. quadribracteolata.*
8. Shoots and petioles densely pubescent. 9
8. Shoots and petioles glabrous or sparsely pubescent. 10
9. Hairs curved and more or less spreading. Fruit globose. ..... 5. *Pr. lucbanensis.*
9. Hairs straight and appressed. Fruit ovoid. ..... 6. *Pr. Everettii.*
10. Leaves with 7–8 pairs of nerves, linear-lanceolate. 11
10. Leaves with 9 or more nerve pairs, lanceolate to elliptic. 13
11. Stipules with a few hairs, and calyx lobes with a trace of pubescence at the top, but for the rest all parts entirely glabrous. .... 7. *Pr. glabra.*
11. Midrib and nerves on the underside sprinkled with long hairs. 12
12. Scales of the upper involucel triangular. The two involucels separated from each other by a short stalk. ..... 8. *Pr. mimica.*
12. Scales of the upper involucel broadly ovate. The two involucels almost contiguous. ..... 9. *Pr. stenophylla.*
13. Involucels, flowers and fruits more or less densely pubescent. Berry 6-locular. ..... 10. *Pr. mindanaensis.*
13. Involucels, flowers and fruits subglabrous. Berry 8-locular. 14
14. Leaves in herbarium material dark-brown, shoots nearly and berries quite black. Young leaves, petioles and shoots at first densely villous. ..... 11. *Pr. Loheri.*
14. Leaves in herbarium material but slightly discolored; shoots and berries brown. Young leaves, petioles and shoots at first but slightly villous. ..... 12. *Pr. sablanensis.*
15. Leaves with 10–11 nerve pairs; epidermis cells of the upper side very large, easily visible with a hand lens; hairs towards the base distinctly thickened. ..... 13. *Pr. affinis.*
15. Leaves with 13–17 pairs of nerves; epidermis cells much smaller, not distinctly visible with a hand lens; hairs not thickened towards the base. ..... 14. *Pr. panayensis.*
16. Young shoots, petioles, midribs and nerves densely villous. ..... 15. *Pr. longistipula.*
16. Young shoots, petioles, midribs and nerves glabrous or subglabrous. . 17
17. Leaves with 10–12 pairs of nerves. ..... 16. *Pr. negrosensis.*
17. Leaves with 17–20 pairs of nerves. ..... 17. *Pr. multinervia.*
18. Shoots sparsely villous, afterwards glabrescent. Leaves oblong. Scales of the upper involucel and calyx lobes lanceolate and 6–7 mm. long. ..... 18. *Pr. triflora.*
18. Shoots densely villous. Leaves linear-oblong. Scales of the upper involucel going out in a very long point. Calyx lobes very narrowly triangular, 10 mm. long, accrescent on the fruit to 17 mm. ..... 19. *Pr. pubescens.*

1. **Praravinia microphylla** (Merr.), n. comb.

Urophyllum microphyllum Merr. in Philip. Jour. Sci. Bot. **12**: 161 (1917), Enum. Philip. Pl. **3**: 523 (1923).

Luzon: Nueva Ecija, Mt. Umingan, alt. 1000 m., *Ramos B.S. 26389*, typus, nondum vidi; Nueva Vizcaya, Mt. Alzapan, *Ramos & Edaño B.S. 45581*, (A), ♂ ?

The plant collected on Mt. Alzapan, Nueva Vizcaya, does not answer the description too well; it is perhaps but a stunted specimen of the next species.

2. **Praravinia acuminata** (Merr.), n. comb.

Urophyllum acuminatum Merr. in Philip. Jour. Sci. Suppl. **1**: 129 (1906), Enum. Philip. Pl. **3**: 521 (1923).

Urophyllum streptopodium Wall. apud Elm., Leafl. Philip. Bot. **1**: 40 (1906), non Wall. ex Hook. f., Fl. Brit. Ind. **3**: 99 (1880).

Luzon: Rizal, Montalban, *Loher 6440* (K), ♂ (buds), *6409* (K), fr., *13758* (A), fr.; Mt. Lumutan, *Ramos & Edaño B.S. 29774* (A), fr.; Mt. Irig, *Ramos B.S. 41995* (A), fr.; Mt. Canumay, *Ramos B.S. 13792* (L), fr.; Isabela, Mt. Moises, *Ramos & Edaño B.S. 47254* (A), fr.; Bontoc, Mt. Masapilid, *Ramos & Edaño B.S. 37945* (A, L), (buds); Nueva Ecija, Mt. Umingan, *Ramos & Edaño B.S. 26391* (A, L), fr.

3. **Praravinia viridescens** (Elm.), n. comb.

Williamsia viridescens Elm., Leafl. Philip. Bot. **9**: 3215 (1934).

Luzon: Pampanga, Mt. Pinatubo, Camp Stotsenburg, alt. 1000 m., *Elmer 22046* (NY, L, K) ♂ et *22078* (NY, L, K) ♀, exempla typorum; Bataan, Mt. Mariveles, *Robinson B.S. 6205* (L), fr.

4. **Praravinia quadribracteolata** (Merr.), n. comb.

Urophyllum quadribracteolatum Merr. in Philip. Jour. Sci. **17**: 483 (1920), Enum. Philip. Pl. **3**: 523 (1923).

Luzon: Tayabas, Infanta-Siniloan Trail, *Ramos & Edaño B.S. 29178* (A), fr.; Apayao, *Fenix B.S. 28161* (A), ♂, exemplum typi.

This species differs from the next in the distinctly pedicellate flowers, the somewhat longer scales of the upper involucel, and the softer pubescence on the underside of the leaves.

5. **Praravinia lucbanensis** (Elm.), n. comb.

Urophyllum lucbanense Elm. Leafl. Philip. Bot. **1**: 71 (1906); Robinson in Philip. Jour. Sci. Bot. **6**: 227 (1911); Merr., Enum. Philip. Pl. **3**: 523 (1923), p.p.

Luzon: Tayabas, Lucban, *Elmer 7945* (A), fr., exemplum typi, *7937* (A, L), (buds); Laguna, San Antonio, *Ramos B.S. 20569* (L), fr.;

Canicosa B.S. 29458 (A), fr.; *Amarillas B.S. 25121* (A), ♂ (buds); *McGregor B.S. 22766* (A), fr.; Rizal, Montalban, *Loher 6410* (K), fr.; Mt. Angilog, *Ramos B.S. 40792* (A), fr.; Nueva Ecija, Mt. Umingan, *Ramos B.S. 26405* (A), fr. CATANDUANES: *Ramos B.S. 30415* (A), fr.

6. **Praravinia Everettii** Merr. in Philip. Jour. Sci. Bot. **10**: 107 (1915).

Williamsia Everettii Merr. Enum. Philip. Pl. **3**: 524 (1923).

NEGROS: Mt. Silay, alt. 700 m., *Everett F.B. 7294*, typus, *F.B. 7268*, nondum vidi. NEGROS ORIENTAL: Cuernos Mts., Dumaguete, *Elmer 9641* (A, L), fr.

Evidently very near to the preceding species.

7. **Praravinia glabra** (Merr.), n. comb.

Williamsia glabra Merr. in Philip. Jour. Sci. Bot. **10**: 108 (1915), Enum. Philip. Pl. **3**: 524 (1923).

LUZON: Tayabas, Siniloan Trail, *Robinson B.S. 9484* (L), ♀, exemplum typi; Laguna, *McGregor B.S. 23047* (A, L), ♂; San Antonio, *Ramos B.S. 16587* (L), ♀; Nueva Ecija, Mt. Umingan, *Ramos & Edaño B.S. 26269* (A), (buds).

A specimen with oblong leaves, probably representing an undescribed species, was collected in Alabat Island [*Ramos & Edaño B.S. 48249* (A)].

8. **Praravinia mimica** (Merr.), n. comb.

Williamsia mimica Merr. in Philip. Jour. Sci. **26**: 495 (1925), Enum. Philip. Pl. **4**: 254 (1926).

MINDANAO: Bukidnon, Mt. Candoon, *Ramos & Edaño B.S. 38790* (A, K), ♀ exempla typi.

9. **Praravinia stenophylla** (Merr.), n. comb.

Williamsia stenophylla Merr. in Philip. Jour. Sci. **27**: 59 (1925), Enum. Philip. Pl. **4**: 254 (1926).

LUZON: Nueva Vizcaya, Caraballo Mts., *Loher s.n.*, typus, nondum vidi.

The difference between this species and *Pr. glabra* is apparently but small: *Praravinia stenophylla* has narrower, not so completely glabrous, leaves.

10. **Praravinia mindanaensis** (Elm.), n. comb.

Williamsia mindanaensis Elm., Leafl. Philip. Bot. **5**: 1904 (1913); Merr. Enum. Philip. Pl. **3**: 524 (1923).

Williamsia caudata Merr. in Philip. Jour. Sci. Bot. **9**: 389 (1914)?

Williamsia sablanensis (Elm.) Merr. apud Elm., Leafl. Philip. Bot. **3**: 1001 (1911), quoad specimina in Mindanao lecta.

MINDANAO: Agusan, Cabadbaran, Mt. Urdaneta, *Elmer 13561* (A, NY, L, K), ♀ et fr., exempla typi; Surigao, *Wenzel 2788* (A, NY), (ster.), *2790* (A), (buds), *Ramos & Pascasio B.S. 34782* (NY), ♀, *Ponce & Mallonga B.S. 26233* (L., K.), fr.; Zamboanga, *Copeland 1642* (K), fr.; Lake Lanao, *Mrs. Clemens 531* (NY, K), fr.; Davao, Mt. Galintan, *Ramos & Edaño B.S. 48882* (NY), fr.; Todaya, Mt. Apo, *Elmer 11846* (A, L), fr.?

The Mindanao specimens agree on the whole very well with each other: in some of them the leaves are nevertheless remarkably narrow. *Elmer 11846* is a dubious identification; it was quoted by Merrill (Enum. **3**: 523) under *U. lucbanense*, but it looks to me more like a poor specimen of *Pr. mindanaensis*: it might be an undescribed species. The specimens collected in the other islands and distributed under this name belong probably to distinct, though nearly related species. Leyte, Samar, Biliran and Panay appear to have each a species of their own: for that occurring in Leyte the epithet *caudata* Merr. might be reinstated. The following specimens were studied:

LEYTE: Cabalian, *Ramos B.S. 41542* (K, L), fr.; Abyog, *Fontanoza B.S. 31130* (NY), fr., *Wenzel 686* (A), ♀, exemplum typi *W. caudata* Merr., *7* (A), fr. SAMAR: Catubig River, *Sablaya 97* (A), fr., *Ramos B.S. 24386* (A, L, K), ♀. BILIRAN: *McGregor B.S. 18744* (A, K), ♀. PANAY: *Martellino & Edaño B.S. 35394* (A) ♂.

11. **Praravinia Loheri** (Merr.), n. comb.

Williamsia Loheri Merr. in Philip. Jour. Sci. **28**: 58 (1925), Enum. Philip. Pl. **4**: 254 (1926).

LUZON: Tayabas, Mt. Binuang, *Ramos & Edaño B.S. 28644* (A), fr.; *B.S. 28766* (A), fr.; Rizal, Montalban, *Loher 12309*, typus, nondum vidi; Kalinga, Mt. Masingit, Lubuagan, *Ramos & Edaño B.S. 37507* (A, L, K), fr.; Nueva Vizcaya, Mt. Alizapan, *Ramos & Edaño B.S. 45586* (A, NY, K), fr.

This species is closely related to the next.

12. **Praravinia sablanensis** (Elm.), n. comb.

Urophyllum sablanense Elm. Leafl. Philip. Bot. **1**: 39 (1906).
Williamsia sablanensis (Elm.) Merr. in Philip. Jour. Sci. Bot. **3**: 165 (1908); Elm. Leafl. Philip. Bot. **3**: 1000 (1911), speciminibus mindanaensibus exclusis; Merr. Enum. Philip. Pl. **3**: 524 (1923), quoad specimina luzoniensia.

LUZON: Abra, Mt. Posuey, *Ramos B.S. 26983* (A), fr.; Benguet, Sablan, *Elmer 6131* (NY, K), ♀, exempla typi; near Baguio, *Elmer 8551* (L), fr.; *Williams 1028* (NY), ♂; Union, Tonglon, *Loher 6362* (K),

fr.; Rizal, Mt. Angilog, *Ramos B.S. 40792* (A), fr.; *Loher 6380* (K), fr.
This species is the type of Merrill's genus *Williamsia*.

13. **Praravinia affinis** (Merr.), n. comb.

Urophyllum affine Merr. in Philip. Jour. Sci. **17**: 481 (1920), Enum. Philip. Pl. **3**: 521 (1923).

LUZON: Tayabas, Mt. Binuang, *Ramos & Edaño B.S. 28482* (A), ♂, *B.S. 28716* (A), (ster.), exempla typorum.

Merrill compared this species with *Urophyllum lucbanense* Elm., which has also been referred to *Praravinia*.

A specimen collected in Pollillo *McGregor B.S. 10211* (L), fr. might belong here, but it is much less hairy.

14. **Praravinia panayensis** (Merr.), n. comb.

Williamsia panayensis Merr. in Philip. Jour. Sci. **17**: 484 (1920), Enum. Philip. Pl. **3**: 524 (1923).

PANAY: Capiz, Jamindan, *Ramos & Edaño B.S. 31043* (A, K), ♀, exempla typi, *B.S. 31310* (A, L), fr. *B.S. 31315* (A, K), ♂ (buds).

15. **Praravinia longistipula** (Merr.), n. comb.

Williamsia longistipula Merr. in Philip. Jour. Sci. **17**: 485 (1920), Enum. Philip. Pl. **3**: 524 (1923).

MINDANAO: Agusan River, *Merrill 7287* (K), ♀ (corollas fallen), exemplum typi.

16. **Praravinia negrosensis** (Merr.), n. comb.

Urophyllum negrosense Merr. in Philip. Jour. Sci. Bot. **5**: 247 (1910); Elm. Leafl. Philip. Bot. **3**: 998 (1911); Merr., Enum. Philip. Pl. **3**: 523 (1923).

NEGROS: *Everett F.B. 5550,* typus, nondum vidi; Negros Oriental, Cuernos Mts., above Dumaguete, alt. 1200–1800 m., *Herre 1140* (A, NY), ♀.

If my identification of Herre's specimen is correct, this species comes very near to the next.

17. **Praravinia multinervia** (Merr.), n. comb.

Williamsia multinervia Merr. in Philip. Jour. Sci. Bot. **10**: 107 (1915), Enum. Philip. Pl. **3**: 524 (1923).

MINDANAO: Zamboanga, *Merrill 8085* (K), ♀, exemplum typi (corollas shed); Malangas, *Ramos & Edaño B.S. 36870* (A), fr. BASILAN: *Miranda F.B. 18933* (K), fr.; *Reillo B.S. 16110* (NY, L), fr.

18. **Praravinia triflora** (Quisumb. et Merr.), n. comb.

Williamsia triflora Quisumb. et Merr. in Philip. Jour. Sci. **37**: 208 (1928).

Luzon: Tayabas, Casiguran, at a low altitude, *Ramos & Edaño B.S. 45458* (A, NY, K), ♂, exempla typi.

19. **Praravinia pubescens** (Quisumb. et Merr.), n. comb.

Williamsia pubescens Quisumb. et Merr. in Philip. Jour. Sci. **37**: 210 (1928).

Luzon: Isabela, Mt. Moises, alt. 1200 m., *Ramos & Edaño B.S. 47275* (A, NY, K), fr., exempla typi; *Clemens 16852* fl. (nondum vidi); *17000* (K), fr.

Apart from the species enumerated above two as yet undescribed ones deserve attention; the specimens available to me, unfortunately, consist of fruiting branches only. One is a plant related to *Pr. acuminata*, but with much narrower leaves: it was collected on Mt. Dingalan, Tayabas [*Ramos & Edaño B.S. 26613* (A)]. The other one resembles *Pr. viridescens*, but is completely glabrous: it came from Ilocos Norte [between Bangui and Claveria, *Ramos B.S. 32995* (L)].

Botanical Museum,
Utrecht.

STUDIES IN THE BORAGINACEAE. XIV*

MISCELLANEOUS SPECIES FROM ASIA, MALAYSIA AND AMERICA

IVAN M. JOHNSTON

Bourreria superba, sp. nov.

Arbor 4–8 m. alta; ramis hornis fuscis laevibus abundanter breviterque villulosis subvelutinis; laminis foliorum late obovatis vel late ellipticis 8–12 cm. longis 5–8.5 cm. latis integris, basi in petiolum 1.5–2.3 cm. longum 1–1.5 mm. crassum abrupte contractis, apice obtusis vel rotundis, supra sublucidis secus costam impressam et nervos primarios basim versus minute inconspicueque villulosis alibi glabris, subtus pallidioribus opacis minute abundanterque villulosis subvelutinis, nervis primariis utroque latere costae subtus prominentis 7–9 prominulis cum nervis secondariis et tertiaris transverse conjunctis; inflorescentia terminali 1–3 cm. longe pedunculata paniculato-corymbosa ut videtur 5–10-flora; alabastro obovoideo glaberrimo ca. 8 mm. crasso ca. 14 mm. longo; calyce ad anthesin campanulato 12–16 mm. longo extus glabro intus abundanter strigoso a basi rotundata 4–5 mm. crassa sursum gradatim ampliato, apice ca. 13 mm. diametro, lobis triangularibus ad 4 mm. longis; corolla grandi infundibuliformi alba 3.5–5 cm. longa (limbo 4–5 cm. diametro), extus praesertim supra medium glandulis stipitatis minutis abundanter obsita, tubo a basi 2–3 mm. crassa sursum gradatim ampliato 2.5–3 cm. longo (apice 2–3 cm. crasso) intus basim versus villoso, lobis ascendentibus latioribus quam longis ca. 1.5 cm. longis ca. 2.2 cm. latis apice rotundis infra medium basim 1 cm. latam versus abrupte contractis; filamentis ca. 5 mm. supra basim tubi corollae affixis, partibus liberis 2.5 cm. longis apice sinus loborum corollae attingentibus, basim versus conspicue abundanterque villoso-ciliatis, infra medium glandulis stipitatis obsitis, supra medium glaberrimis; antheris ca. 5 mm. longis 1 mm. crassis basim versus affixis; stylo glabro, ramis 1 cm. longis, stigmate 1.5 mm. diametro ramis subduplo latiori; ovario glabro; drupis ignotis.

MEXICO: San José, Coalcoman Dist., Michoacan, 750 m. alt., llano by river, tree 8 m. tall, fl. white, June 22, 1939, *Geo. Hinton 13834* (TYPE, Gray Herb.); Villa Victoria, Coalcoman Dist., Michoacan, 700 m.

*For STUDIES IN THE BORAGINACEAE. XIII. see Jour. Arnold Arb. **20**: 375. 1939.

alt., wooded hill, spreading tree 4 m. tall, fl. white, July 10, 1939, *Hinton 13905* (G).

This remarkable species comes from southwestern Michoacan. It is most closely related to *B. huanita* (Llav. & Lex.) Hemsl. but differs conspicuously in its very large funnelform corollas and broad obtuse or rounded leaves. The outside of the corolla-tube and both surfaces of the lobes are glandular puberulent. The huge size and the funnelshape of the corolla in this species are unique, not only in the genus, but even in the subfamily, Ehretioideae, to which the genus belongs.

Heliotropium michoacanum, sp. nov.

Herba "5 dm. alta" basim versus suffruticosa; ramis gracilibus 1–2.5 mm. crassis 15–40 cm. longis stricte longeque pauciramosis pilos minutos 0.2–0.7 mm. longos adpressos saepe curvatos vel contortos et setas rigidas adpressas vel stricte ascendentes saepe e basi subbulbosa orientes gerentibus, internodiis plerumque 2–5 cm. longis; foliis haud firmis viridibus utroque cum setis 0.2–1.2 mm. longis adpressis (supra nonnullis e basi pustulata minuta orientibus) sparse strigosis; lamina 3–7 cm. longa 1–2.5 cm. lata paulo infra medium latioribus utrinque attenuata, apice acuta, basi in petiolum gracilem 3–11 mm. longum abrupte attenuata, subtus costa et nervis (utraque 3–4) prominulis donata, nervis secondariis perinconspicuis; inflorescentiis ebracteatis terminalibus (sed caulibus sympodialibus, ergo cymis maturis tandem pseudolateralibus) maturitate elongatis gracilibus ascendentibus 10–15 cm. longis usque ad 1–5 cm. supra basim nudis alibi abundanter floriferis, rhachi juventate dense albo-strigosa mox sparse strigosa et viridiore; calyce ad anthesin subsessili solum basim versus dense strigoso, lobis distincte inaequalibus lanceolatis, lobo majore ad 3.5 mm. longo et 1 mm. lato quam tubo corollae paulo longiore, ceteris ad 3 mm. longis linearilanceolatis 0.2–0.5 mm. latis tubo corollae subaequilongis; calyce fructifero paulo accrescente sparse strigoso viridi ca. 1 mm. longe pedicellato, inferioribus 9–14 mm. distantibus, medialibus 3–5 mm. distantibus; corolla alba inconspicua 4–5 mm. longa intus glabra extus sparse strigosa, limbo patente ad 5 mm. diametro, tubo cylindrico 3 mm. longo; antheris subsessilibus inclusis ca. 1 mm. supra basim tubi corollae affixis ad 1.4 mm. longis elongatis rectis in tertia parte superiore angustioribus, apice liberis glabris glandulosis obtusiusculis; ovario glabro; stigmate sursum attenuato ad 0.9 mm. longo ca. 4-plo longiore quam lato quam stylo 4–5-plo longiore; fructu depresso haud lobato 2.5 mm. diametro 1.5 mm. alto sparse strigoso stigmate subsessili coronato.

Mexico: Barroloso, Coalcoman Dist., Michoacan, 1300 m. alt., in

woods, becoming 5 dm. tall, fl. white, Aug. 7, 1939, *Geo. Hinton 15069* (TYPE, Gray Herb.).

A well marked species related to *H. fallax* Johnston of Guatemala and Chiapas and particularly to **H. Hintonii,** comb. nov. (*H. fallax* var. *Hintonii* Johnston, Jour. Arnold Arb. **18:** 15. 1937) of central Guerrero (Rio Balsas, *Orcutt 4385*) and southern parts (Temascaltepec Dist.) of the state of Mexico. The new species comes from extreme western Michoacan. From its relatives the proposed species differs in having a short corolla-tube and unjoined anthers, glabrous at the apex. The plant is green rather than pallid. The sepals equal or even surpass the corolla-tube in *H. michoacanum*. In *H. fallax* and *H. Hintonii* the tube conspicuously surpasses the calyx.

Onosma kashmirica, sp. nov.

Planta biennis vel perennis erecta; caulibus ad 5 dm. longis basim versus ad 8 mm. crassis simplicibus foliosis pallidulis hirsutis (setulis patentibus minutis et setis rigidis patentibus pallidulis conspicuis 2–5 mm. longis donatis) apicem versus cymas 1–3 gerentibus; foliis viridibus medio costatis enervatis conspicue hirsutis et minute echinatis; foliis basalibus 15–20 cm. longis 10–14 mm. latis apicem versus latioribus deinde basim versus gradatim attenuatis apice acutiusculis; foliis caulinis numerosis ascendentibus ligulatis, infra medium caulis majoribus 6–9 cm. longis 8–18 mm. latis basim versus abrupte contractis sessilibus apice acutis vel obtusis, superioribus gradatim minoribus; cymis scorpioideis ad anthesin dense congestis, fructiferis elongatis ad 15 cm. longis (floribus 5–10 mm. distantibus), bracteis foliis supremis caulis similibus sed gradatim minoribus plus minusve lanceolatis 1–3 cm. longis 4–10 mm. latis sessilibus apice saepe attenuatis; calyce ad anthesin 12–16 mm. longo 2–5 mm. longe pedicellato, lobis linearibus ca. 1.5 mm. latis acutis adpresse flavescenterque hispidis et minute echinatis; calyce fructifero 5–12 mm. longe pedicellato 16–25 mm. longo, tubo cupulato 2–5 mm. profundo, lobis erectis 14–19 mm. longis cuneato-lanceolatis mediocostatis acutis setas ascendentes conspicuas flavescentes pungentes gerentibus infra medium 2–3.5 mm. latis; corolla flava 2–3 cm. longa granulato-puberulenta apicem versus 8–10 mm. diametro imo ad basim ca. 4 mm. crassa, lobis 3.5 mm. latis ad 2 mm. longis late triangularibus margine reflexis minute sparseque ciliolatis; filamentis ca. 10 mm. longis 5–10 mm. supra basim tubi corollae orientibus infra medium in tubum corollae decurrentibus; antheris ca. 1 mm. longis apice e corolla 2–3 mm. longe exsertis, connectivo dorse pilis brevibus et crassis abundanter donato; nuculis nitidis albidis 5–6 mm. altis.

British India: Pan Dras, Ladak road, Kashmir, 3000 m., Aug. 1928, *R. R. Stewart 10053* (type, Gray Herb.); Dartse to Tsanskar Sumdo, Lahul, Punjab, June 17, 1856, *Schlagintweit 4432* (G); Jashrang cliffs, Simla District, Bashahr State, Punjab, 2940 m., May 29, 1928, *R. N. Parker 2914* (G); Muksi (T.), Kolong, Chenab Valley, Lahul, Kangra, Punjab, 3300 m., July 16, 1933, *T. R. Chand 115;* western Himalayas, 1500–2400 m., *Thomson* (G); no locality given, *ex herb. Falconer* (G).

This is the plant of the western Himalayas treated by Clarke in Hook. f. Fl. Brit. India **4**: 178 (1883), as *Onosma echioides*. It is given as ranging from Kashmir to Kumaon at 1500–3000 m. alt. It has been illustrated and described, as *O. echioides* Linn., by Blatter, Beautiful Flowers of Kashmir **2**: 60, t. 45, fig. 3 (1929). The plant, however, is not closely related to the European *O. echioides*. Its closest relations are with *O. setosum* Ledeb. of central Asia, from which it differs in its less branched and less abundantly bristly stems and in its broader, coarser and yellow-bristly fruiting calyces.

Lasiocaryum densiflorum (Duthie), comb. nov.

Eritrichium densiflorum Duthie, Kew Bull. **1912**: 39.
? *Oreogenia Duthieana* Brand in Fedde, Repert. **22**: 103 (1925); Pflanzenr. IV. **252**^{2}[Heft 97]: 186 (1931).
Microcaryum Duthieanum Brand in Fedde, Repert. **22**: 101 (1925); Pflanzenr. IV. **252**^{2}[Heft 97]: 202 (1931).

The binomial, *M. Duthieanum* Brand, is essentially a new name for *E. densiflorum* Duthie. Brand seems to have discarded Duthie's trivial name since he believed Duthie's species was an aggregate. Duthie's description, however, applies well to the readily recognizable *Lasiocaryum* of the central and western Himalayas which is related to *L. Munroi* but is coarser and more spreading, and has larger (2–3 mm. rather than ca. 1.5 mm. wide) corollas. It is similar to *M. trichocarpum* of southwestern China but that erect plant has larger (3–5 mm.) corollas and the lower flowers of its cymes are distinctly (3–5 mm. long) pedicellate.

Lasiocaryum diffusum (Brand), comb. nov.

Microcaryum diffusum Brand in Fedde, Repert. **22**: 101 (1925); Pflanzenr. IV. **252**^{2}[Heft 97]: 202 (1931).

This plant has the habit of *L. Munroi* but is more slender and is greener and much more sparsely hairy throughout, particularly so on the calyx. The pedicels are usually very elongate. Its fruit is covered with more rigid, less appressed, trichomes and its dorsal surfaces are usually more prominently rugose than in *L. Munroi*. The differences in nutlet

attachment, however, is most striking. The elongate broad ventral opening in the pericarp, found in all other species of the genus, is in *L. diffusum* closed except near the base.

The genera *Microcaryum* and *Oreogenia* (the latter a homonym, later changed to *Lasiocaryum*) were originally proposed as monotypic genera to include the Himalayan *Eritrichium pygmaeum* Clarke and *E. Munroi* Clarke. In his treatments of the eritrichioid Boraginaceae, Brand expanded and redefined these two genera to include a total of eleven species, four in *Microcaryum* and seven in *Oreogenia*. His concept of these genera was evidently artificial and confused. Three of the species he placed in these genera, *Oreogenia persica* (Boiss.) Brand, *O. Paulsenii* (Fedtsch.) Brand, and *O. ferghanica* Brand, are undoubtedly species of *Lappula* and probably synonyms of *L. microcarpa* (Ledeb.) Brand, while two others, *Microcaryum turkestanicum* (Franch.) Brand, and *Oreogenia arassanica* (Fedtsch.) Brand, can readily be accommodated in the genus *Eritrichium*.

The illustrations given by Brand, Pflanzenr. Heft 97: 186 and 202 (1931), show the very different nutlets that characterize *Lasiocaryum* and *Microcaryum*. The nutlets of true *Microcaryum* are angulate and have a firm glabrous pericarp. There is a small oblique suprabasal attachment. The ventral keel is prominent and from the apex is a suture-keel formed by the adhesion of thickened pericarpial edges. These thickened pericarpial edges continue as a rim about the nutlet attachment.

In true *Lasiocaryum* (the correct name for *Oreogenia*) the rounded nutlets have a thin pericarp producing unique short straight or curved bristles which are commonly more or less appressed. In all species, except *L. diffusum*, the attachment-area is narrowly oblong, distinctly lateral and extends over the lower two-thirds of the ventral face. It is not surrounded by thickened pericarpial edges. The short weak keel which extends from the attachment area to the nutlet apex is not a suture but an angle in the pericarp. In *L. diffusum* the conditions are essentially similar. The elongate lateral attachment area found in other species, however, has in *L. diffusum* been narrowed by the encroachment of the pericarpial margins. Above the middle, the attachment area is nearly closed, while below the middle, it has become triangular or subulate in outline. The principal attachment surface, hence, occurs in the lower third of the nutlet ventrum. Above it is a groove formed by the approach of pericarpial walls and in the upper third of the nutlet there is a keel formed by an angle in the unbroken pericarp. Brand placed *L. diffusum* in the genus *Microcaryum*, but in habit and all technical details it is evidently a congener of *Lasiocaryum Munroi*.

Actinocarya acaulis (W. W. Smith), comb. nov.

Eritrichium acaule W. W. Smith, Rec. Bot. Surv. India **4**: 225 (1911).

The nutlets of this species have a crown-like dorsal margin, made up of somewhat confluent glochidiate appendages, and hence roughly suggest those of *Eritrichium*. They have, however, a subapical attachment. Furthermore, they bear, particularly about the basal end, an additional series of distinct glochidiate appendages outside of the primary coronate dorsal margin. The species is most certainly not a member of the genus *Eritrichium*. It is, in fact, an additional member of the *Actinocarya*, a Himalayan genus previously considered monotypic.

The two species of *Actinocarya* are very similar in gross habit. Both are widely distributed in the Indian Himalaya. The original species *A. tibetica* Benth., is apparently glabrous though in reality the leaves are pustulate and strigose beneath. The dimorphic fruits bear numerous minute frequently uncinate hairs as well as numerous glochidiate appendages. In *A. acaulis* the stems and leaves bear relatively coarse elongate loosely appressed hairs. The fruit is nearly glabrous and the secondary glochidiate appendages are fewer and tend to be crowded just outside of the coarse dorsal margin of the nutlets.

The fruits of *A. tibetica* are dimorphic. Those borne along the stems are long-pedicellate and are composed of apically attached nutlets bearing a small crown perched on the back towards the base. Outside this small crown are numerous scattered glochidiate appendages. The fruit produced about the base of the plant has short stout pedicels and more compressed nutlets. The dorsal crown is incomplete or entirely absent. Numerous scattered glochidiate appendages, however, are always present. Depauperate plants of *A. tibetica* may produce only the basal type of fruits. The species, indeed, has a synonym in *Hackelia minima* Brand in Repert. Sp. Nov. **22**: 104 (1925), which was based upon such a depauperate plant.

Eritrichium Thomsoni (Clarke), comb. nov.

Omphalodes Thomsoni Clarke in Hook. f. Fl. Brit. India **4**: 155 (1883).

This Himalayan plant is most certainly not a member of *Omphalodes*. It has fruit which, in shape, attachment and appendages is thoroughly characteristic of *Eritrichium*, in the strict sense, and there is no reason for not treating the plant under that genus.

Amblynotus dauricum (Pallas), comb. nov.

Myosotis daurica Pallas ex R. & S. Syst. **4**: 774 (1819).
Eritrichium dauricum Brand, Pflanzenr. IV. **252**[2][Heft 97]: 193 (1931).
Myosotis obovata Ledeb. Fl. Altaica **1**: 190 (1829).

Eritrichium obovatum DC. Prodr. **10**: 128 (1846).
Amblynotus obovatus Johnston, Contr. Gray Herb. **73**: 64 (1924).

Hackelia thymifolia (A. DC.), comb. nov.

Echinospermum thymifolium DC. Prodr. **10**: 136 (1846).
E. deflexum var. *pumilum* Ledeb. Fl. Ross. **3**: 155 (1847).
Hackelia deflexa var. *pumila* Brand, Pflanzenr. IV. **252**[2][Heft 97]: 126 (1931).

Though confused with *Hackelia deflexa* Opiz, this plant of eastern Siberia and Manchuria is evidently distinct. It is a much smaller, more slender and much branched plant with tiny corollas, smaller fruit and proportionately much shorter pedicels.

Hackelia echinocarya, sp. nov.

Herba ut videtur annua strigosa viridis gracilis; caulibus ascendentibus vel erectis 3–4 dm. altis sparse ascendenterque ramosis basim versus 1–1.5 mm. crassis strigosis (pilis 0.5–1 mm. longis rigidis); foliis basalibus non visis; foliis caulinis viridibus oblanceolatis 2–4 cm. longis 3–6 mm. latis medium versus vel supra medium latioribus apice acutis; foliis inferioribus basi in petiolum gracilem ad 1 cm. longum gradatim attenuatis; foliis medialibus majoribus breviter petiolatis vel subsessilibus; lamina folii medio-costata sed enervata margine inconspicue revoluta utrinque strigosa; cymis gracilibus ramos foliatos terminantibus imam ad basim bracteatis alibi ebracteatis maturitate 10–15 cm. longis; floribus ad 1 cm. distantibus; pedicellis rigidis erectis 1–7 mm. longis apice plus minusve cernuis; calycibus fructiferis patentibus, lobis oblongis 2–2.5 mm. longis 0.5–0.8 mm. latis apice acutiusculis; nuculis 4 homomorphis opacis (minute irregulariterque verrucosis) pilos minutos rigidos erectos numerosos proferentibus, margine aculeos uniseriatos glochidiatos rariter denticulatos 1–1.5 mm. longos compressos basim versus paullo confluentes gerentibus, facie exteriore 2.2–2.5 mm. longis infra medium 1.5–1.8 mm. latis obtusis medio-carinatis, facie interiore angulatis subtrifacialibus paulo supra medium areolam ovatam 0.5 mm. longam gerentibus; gynobasi depresse pyramidali cum stylo ca. 0.5 mm. longo instructo; stylo apices nucularum haud attingente.

China: A-tun-tze, Yunnan, 2700 m., herb on open slope, corolla greenish yellow, Sept. 1935, *Wang 70292* (type, Gray Herb.).

This very distinct species seems to be most closely related to *H. thymifolia* (A. DC.) Johnston, of Manchuria and adjacent Siberia. It differs in having homomorphous nutlets which are verrucose on all surfaces and echinate (with minute stiff erect bristles) on the back and face and even on the marginal appendages. The hairs on the leaves are longer and

more closely appressed than in *H. thymifolia*. The fruit of this latter, more northern species, has heteromorphic nutlets. One nutlet is muricate while the remaining three are more broadly margined and smooth. The odd nutlet has the bristles springing from bulbous bases. These are not present on the margin. In the proposed species the bristles on the nutlets do not have bulbous bases. They are present even on the nutlet-margin and frequently give the latter a ciliate appearance.

I have seen only old withered corollas of *H. echinocarya*. These are about 2 mm. long and have orbicular lobes almost 1 mm. long. The tube is broadly cylindrical and about 0.8 mm. thick. The minute nearly orbicular anthers reach to almost two-thirds the height of the tube. The minute trapeziform faucal appendages are puberulent. Their apices slightly surpass the level of the corolla sinus. They bear a minute ellipsoidal gland. The collector gives the flower-color as greenish yellow. The very similar corollas of *H. thymifolia* seem to be white or even slightly yellowish or bluish.

Rochelia laxa, sp. nov.

Herba annua erecta 5–20 cm. alta e basi laxe ascendenterque longiramosa cum pilis tenuibus rigidis adpressis vel ascendentibus vestita; foliis inferioribus oblanceolatis basim versus attenuatis ceteris linearibus vel oblongis; cymis racemiformibus parvibracteatis unilateralibus; corolla purpureo-caerulea ad 2.5 mm. longa, lobis orbiculari-ovatis ad 0.8 mm. longis; calycibus fructiferis 3–5 mm. longis 5–20 mm. distantibus basi rotundis (haud auriculatis vel gibbosis); lobis 5 ligulatis vel oblongo-lanceolatis 2.5–4 mm. longis 0.5–0.8 mm. latis ascendentibus vel arcuato-decurvatis apices nucularum 0.5–1 mm. longe superantibus, supra medium herbaceis inconspicue costatis, apice acutis, infra medium crasse costatis et membranaceo-marginatis extus pilos rigidos uncinatos e basi bulbosa orientes 1–3 mm. longos proferentibus; pedicellis fructiferis 3–8 mm. longis cum pilis uncinatis rigidis obsitis imam ad basim refractis rectis patentibus apicem versus vix incrassatis; nuculis binis 3–3.3 mm. longis abundanter minuteque tuberculatis, tuberculis pilos perinconspicuos stellatos mox deciduos gerentibus; stigmate 0.2–0.5 mm. apicem nucularum superante.

British India. Kashmir: Mitsahoi, Ladak Road, 3150 m., Aug. 1928, *R. R. Stewart 10002A* (G); Rachogba, Rupshu, 4020 m., dry ground, fl. baby blue with whitish eye, June 24, 1931, *Koelz 2104* (G); Bok, Zanskar, 3450 m., camp-ground, Sept. 13, 1931, *Koelz 2946 a* (type, Gray Herb.). Punjab: Jispa, Lahul, 3150 m., dry plain, fl. baby blue with narrow white eye, June 15, 1931, *Koelz 2042* (G);

Sisu, Lahul, 3600 m., lawn of dak bungalow, fl. blue-purple, June 11, 1931, *Koelz 2030* (G); Rarig, Lahul, 3600 m., fl. purple-blue, July 7, 1933, *Koelz 5304* (G).

This very well marked species appears to have its closest relative in *R. macrocalyx* Boiss. (includes *R. rectipes* Stocks). It differs in its much more loosely branched habit, elongate inflorescences, and deflexed-spreading rather than ascending pedicels, as well as in its coarser obtusish calyx-lobes which only very shortly surpass the nutlets. It also has smaller nutlets and a shorter style. There are now five species of *Rochelia* known from India,— *R. laxa* Johnston, *R. macrocalyx* Boiss., *R. cardiosepala* Bunge, *R. stylaris* Boiss. and *R. disperma* (L.) Wettst. Only *R. laxa* and *R. macrocalyx* bear uncinate hairs on the pedicels and calyx.

Trigonotis tenera, sp. nov.

Planta herbacea strigosa; caulibus pluribus subsimplicibus strigosis 1–2.5 dm. longis 0.5–1 mm. crassis gracillimis ut videtur prostratis vel laxe decumbentibus e radice gracili orientibus; foliis basalibus 4–7 mm. longe petiolatis, lamina triangulari- vel oblongo-ovata vel subcordata 2–4 cm. longa 1.4–2.2 cm. lata apice acuta vel obtusiuscula basi truncata vel subcordata; foliis superioribus valde sed gradatim reductis, supremis (ad basim inflorescentiae) 5–10 mm. longis et 1–4 mm. longe petiolatis; inflorescentia gracillima simplice 7–20-flora racemosa unilaterali caulem foliosum terminante 8–16 cm. longa; floribus infimis (2–3) bracteatis, ceteris ebracteatis; floribus fructiferis 5–10 mm. distantibus; pedicellis ascendentibus gracillimis ad anthesin 2–3 mm. longis fructiferis 3–4-plo longioribus; corolla 2 mm. longa caerulea, tubo ca. 1.2 mm. longo glabro; calyce strigoso lobis ad anthesin ca. 2 mm. longis ascendentibus lanceolatis, lobis calycis fructiferi paulo accrescentibus ad 3 mm. longis, tubo calycis fructiferi 0.5–0.8 mm. longo plus minusve distincto pallido cupulato; nuculis 1–1.3 mm. longis haud tetrahedralibus bifacialibus sparse breviter pilosis, dorse subplanis in ambitu ovatis, basi rotundis vel obtusis, apice acuminatis, margine inconspicue incrassatis obtusiusculis, antice valde angulatis acutis, carina infra medium nuculae in stipitem 0.3–0.5 mm. longum divergentem abrupte transmutata.

China: Meng Shan, Fei Hsien, Shantung Prov., 900 m., very tender herb on side of wall, fl. small blue, Aug. 4, 1936, *Cheo & Yen 312* (type, Gray Herb.); Meng Shan, Fei Hsien, 1100 m., herb in shade, fl. blue, Aug. 6, 1936, *Cheo & Yen 342* (G).

A delicate perennial herb with numerous very slender stems. The leaves are thin and inconspicuously strigose. Those about the base of

the plant have slender elongate petioles. The slender unilateral inflorescence terminates the nearly simple stems. Since the inflorescence is bractless except at the base, the plants appear to be leafy up to the middle and leafless above. The nutlets are elongate with a flattish obscurely margined back and a sharply angulate inner face. The ventral keel diverges at an acute angle from the plane of the dorsal face and below the middle of the nutlet continues off as a well developed divergent stipe. This stipe is straight or slightly incurved. The basal anterior portion of the nutlet (corresponding to the basal triangular anterior face in tetrahedral nutlets) is not conspicuous. The nutlets are evidently elongate and bifacial.

Trigonotis Archboldii, sp. nov.

Herba decumbens; caulibus foliosis assurgentibus 1–2 dm. altis simplicibus vel sparse ascendenterque ramosis 1–2.5 mm. crassis cum pilis fulvis crassis rigidis ca. 1 mm. longis adpressis vel ascendentibus vestitis; foliis firmis evidenter costatis sed enervatis, supra glabris vel laminae apicem versus sparse strigosis, subtus pallidioribus secus costam et marginem strigosis alibi saepissime glabris, setis folii valde adpressis rigidis 0.3–0.5 mm. longis non rariter e basi pustulata orientibus; lamina elliptica vel lanceo-elliptica 1.5–4 cm. longa 0.9–1.5(–1.9) cm. lata, apice rotunda vel obtusa apiculata, basi in petiolum ad 2 mm. latum 1–2.5 cm. longum abrupte contracta; cymis terminalibus (sed perspicue lateralibus) 10–40-floris racemosis ebracteatis vel rariter imam ad basim bracteatis, fructiferis 3–8 cm. longis ad 1 cm. crassis cylindraceis; corolla 6–8(–"12") mm. diametro, tubo ad 2 mm. longo; calyce ad anthesin 2 mm. longo 2–4 mm. longe pedicellato, lobis ovatis acutis ca. 1 mm. longis apice ca. 0.4 mm. infra appendiculas faucium corollae attingentibus; calycibus fructiferis 2.5–3 mm. longis ca. 5 mm. longe ascendenterque pedicellatis, lobis ellipticis quam nuculis ca. 3–4-plo longioribus; nuculis erectis tetrahedralibus ca. 1 mm. altis laevibus nitidis angulatis acutis basi affixis.

British New Guinea: Mt. Albert Edward, headwaters of Chirima River, 3550 m., common, massed between boulders on river-bottom, ascending herb, fl. pink ca. 12 mm. diameter, June 29, 1933, *Brass 4381* (G); Murray Pass, Wharton Range, 2840 m., grassland bordering forest and on banks of streams flowing through forest, common, fl. white, July 25, 1933, *Brass 4598* (G); Mt. Tafa, 2310 m., edge of road and resthouse clearing, common, fl. white, May 24, 1933, *Brass 4024* (type, Gray Herb.).

This is a conventional *Trigonotis* with the flowers in an elongate naked

racemose cyme. Only two other species of this group are known from New Guinea. These are *T. inoblita* F. v. Muell., Trans. Roy. Soc. Victoria, ser. 2, 1: pt. 2, p. 31 (1889), from the crest of the Owen Standley Ranges, and *T. Haackei* F. v. Muell. l.c. 30, from Mt. Victoria. The types were collected by Sir William MacGregor in 1889. The present species is most closely related to *T. inoblita* from which it differs in its very much larger corollas, longer pedicels, and more elongate leaf-blades. *Trigonotis inoblita,* judging from description, has orbicular- to elliptic-ovate leaf-blades, petiolate below and sessile above, corollas 2–3 mm. broad, and pedicels 1–2 mm. long. The other Papuan species, *T. Haackei,* has the leaves "linear- to elongate-lanceolate or the lower more ovate, broadly sessile," crowded, 18–36 mm. long and the naked "corymbiform" cymes 2–5 cm. long. The pedicels are as long as the calyx (ca. 4 mm.) or soon somewhat longer. The nutlets are 2–2.5 mm. long and apparently bifacial. The corolla must be over 5 mm. broad. This latter species is evidently a distinct one and very different from *T. inoblita* and *T. Archboldii.* The present species is named in honor of Mr. Richard Archbold, well known explorer. The type was collected during his first expedition to New Guinea.

Trigonotis abata, sp. nov.

Herba repens; caulibus 0.5–1 mm. crassis elongatis longe dichotome ramosis strigosis; foliis alternis 3–20 mm. distantibus asymmetricis ovatis vel ellipticis 8–20 mm. longis 8–15 mm. latis, utrinque setis 0.5–1 mm. longis rigidis (in facie superiore laminae ascendentibus, in facie inferiore adpressis) e basi pustulata orientibus obsitis, costatis (costa curvata) sed enervatis, apice obtusis apiculatis, basi laminae obliquis, in petiolum subvaginatum ad 2 mm. longum et latum abrupte contractis; floribus caulinis solitariis extra-axillaribus saepe infra petiolos gestis; pedicellis strigosis ad anthesin 1–2 mm. longis maturitate 2–3 mm. longis recurvatis; calycibus ca. 2 mm. longis strigosis, lobis lanceolatis ca. 1 mm. longis quam tubo corollae duplo longioribus; lobis calycis fructiferi oblongo-ovatis acutis ad 3 mm. longis 1.5 mm. latis, apice acuminatis nuculas paulo superantibus; corolla alba, limbo ad 5 mm. diametro; nuculis 4 angulatis erectis nigris laevibus (vel sub lente minutissime punctulatis) 1.5 mm. latis ca. 2.1 mm. longis dorsi-ventraliter compressis ergo duplo latioribus quam crassis, dorso in ambitu ovatis 1.5 mm. latis ca. 2 mm. longis, ventre carinatis obtusis, ima ad basim carinae cicatrice obliqua minuta triangulata donatis; gynobasi late pyramidali; stigmate ca. ⅔ altitudinem nuculae attingente.

DUTCH NEW GUINEA: 7 km. NE. of Wilhelmina-top, 3560 m. alt.

creeping in ground-moss of forest-edge, locally common, fl. white, Sept. 1938, *Brass & Myer-Drees 9838* (TYPE, Gray Herb.); Lake Habbema, 3225 m., creeping in ground-moss, shrubbery bordering forest, fl. white, Aug. 1938, *Brass 9477* (G); 9 km. NE. of Lake Habbema, 2800 m., prostrate and creeping on open sandy bed of a stream, rare, fl. white, Oct. 1938, *Brass 10818* (G).

This very distinct species is remarkably similar in all vegetative details to the plant of northeastern New Guinea described as *Zoelleria procumbens* Warb. The only obvious difference is in the length of the petioles. This creeping plant roots at its nodes and clings close to the ground. Its leaves, alternating on either side of the slender stems, are flattened against the substratum. So flattened against the soil is the plant that the stem and leaf-blades lie in a single plane. In accommodating a basic 3/5 phyllotaxy to this flattened dorsi-ventral distichous arrangement the short petioles have become slightly twisted and the blade obliquely reflexed at its base.

The discovery of this and the following Papuan species has forced a consideration of the precise relationship existing between the Malaysian genera *Zoelleria* Warb. (1892) and *Havilandia* Stapf (1894), and the more widely distributed genus *Trigonotis*. As a result I am now of the opinion that these three genera are so closely and intimately related that their continued separation can no longer be justified. *Zoelleria* and *Havilandia* agree in all vegetative and floral details except the number of ovules. The only justification for separating them from *Trigonotis* must rest in their type of inflorescence and in the form of their nutlets. The flowers of these Malaysian genera are borne singly along leafy prostrate or creeping stems. In *Trigonotis* the flowers are borne in terminal racemose cymes. These cymes are usually naked but in some species (e.g. *T. radicans* Maxim. and *T. delicatula* Hand.-Mazz.) they bear numerous conspicuous leafy bracts scattered throughout. These leafy bracts oppose the pedicels or are borne above them. The flowers of *Zoelleria* and *Havilandia* are also extra-axillary. There is accordingly no real morphological difference between *Zoelleria* and *Havilandia* and the species of *Trigonotis* mentioned, either in inflorescence or growth-habit.

The nutlets of the species of *Zoelleria* and *Havilandia*, previously known, are very uniform in structure and shape. In the particular case of *Zoelleria procumbens* and *Havilandia papuana* they are so similar as to be almost indistinguishable. They are somewhat compressed laterally and have a rounded back. They have no ridges, wings, nor angles which distinctly separate the dorsal and ventral surfaces and thus form

the so-called "bifacial" nutlet. The tetrahedral form, which prevails in *Trigonotis,* and which develops by the formation of a transverse angle or ridge across the back of a bifacial nutlet, is not known in these older species of *Havilandia* or *Zoelleria.* These details in nutlet-form perhaps could have justified the continued recognition of *Zoelleria* and *Havilandia* had not the present species been discovered. In *Trigonotis abata,* n. sp., we have a species which agrees with *Zoelleria procumbens* in almost all, even the most minor details, except only in the number and form of its nutlets. Such extended agreement can only be the result of a very strong and intimate relationship. Yet though giving every evidence of a close relationship with *Zoelleria procumbens* our new species has only four nutlets and these bifacial in form. In type and form its nutlets agree perfectly with those of such indubitable members of *Trigonotis* as, *T. heliotropifolia* Hand.-Mazz., *T. delicatula* Hand.-Mazz. and *T. Rockii* Johnston. The Papuan plant falls naturally and inevitably into *Trigonotis.* With *T. abata* established as an indubitable species of *Trigonotis,* all the supposed peculiarities in habit, which might have been used to justify the continued recognition of *Zoelleria* and *Havilandia,* have been completely destroyed. These small putative genera and *Trigonotis* can be distinguished only by the presence or absence of a marginal wrinkle or ridge in the pericarp. When the obviously close affinity of *Zoelleria procumbens* and *Trigonotis abata* is considered, the difference in the presence or absence of a wrinkle seems trivial indeed. These small Malaysian genera are consequently submerged in *Trigonotis.*

In submerging *Zoelleria* in *Trigonotis* I am aware that Gürke, Engl. & Prantl, Nat. Pflanzenf. IV. 3a: 81 and 131 (1893) considered it so remarkable that he placed it in a special tribe (the *Zoelleriae*) as the culmination of evolution in the *Boraginaceae.* His sole reason for doing this was found in the pleiomerous gynoecium. The original species, *Zoelleria procumbens,* has flowers producing 10 ovules and 10 nutlets. Another species, which must go into *Zoelleria* if that genus continues to be recognized, is described below as *Trigonotis pleiomera.* It develops 8–10 ovules and nutlets. Both species come from northeastern New Guinea. It is an interesting fact, however, that both of these species, which are obviously different, show strong affinities with species that have a normal gynoecium and so are excluded from the genus. As has been mentioned, *Zoelleria procumbens* agrees with *Trigonotis abata* in all characters save only the shape and number of nutlets. Similarly, *Trigonotis pleiomera* agrees with *Havilandia robusta* Johnston in practically all details except the number, form and markings of the nutlets. The agreement between *Trigonotis pleiomera* and each species of *Havi-*

landia is so extensive and so detailed that mere differences in number of ovules developed seem trivial and rather specific than generic in value. In fact, I am of the opinion that the pleiomerous gynoecium of *Zoelleria,* far from being the survival of a condition in the ancestors of the *Boraginaceae,* is merely a recent reversion to that condition. It is interesting, but is merely a secondary character of recent origin, present in two species both of which have other evident relatives with normal gynoecia.

Eight Malaysian species are known to belong to the *Zoelleria* and *Havilandia* groups of *Trigonotis.* These prostrate plants with cauline flowers may be readily keyed as follows:

Ovules and nutlets 8–10.
- Corolla 7–9 mm. broad; leaves elliptic- to obovate-oblong, strigose on margin and midrib, otherwise glabrous. ....*T. pleiomera.*
- Corolla ca. 4 mm. broad; leaves orbicular to ovate, conspicuously strigose on both faces. .....*T. procumbens.*

Ovules and nutlets 4.
- Nutlets angulate, dorso-ventrally compressed, margined. .....*T. abata.*
- Nutlets with rounded back, somewhat laterally compressed, not margined.
  - Leaves linear-lanceolate, acute. .....*T. minuta.*
  - Leaves oblong-obovate to oblanceolate, apex obtuse or rounded.
    - Fruit opaque, minutely tuberculate.
      - Corolla 8–10 mm. broad; pedicels 8–12 mm. long; leaves oblanceolate. .....*T. robusta.*
      - Corolla 4 mm. broad; pedicels 1–2 mm. long; leaves elliptic or obovate. .....*T. opaca.*
    - Fruit lustrous, smooth.
      - Leaves oblanceolate, gradually contracted into the petiole; nutlets lanceolate; Borneo. .....*T. borneensis.*
      - Leaves obovate or elliptic, abruptly contracted to a short sheathing petiole; nutlets short; Papua. ...*T. papuana.*

Trigonotis pleiomera, sp. nov.

Herba prostrata; ramis gracilibus 0.5–1 mm. crassis elongatis ascendenter ramulosis strigosis; foliis alternis elliptico- vel obovato-oblongis 1–2 cm. longis 3–9 mm. latis medium versus vel supra medium latioribus, apice rotundis vel late obtusis obscure apiculatis, basi in petiolum ca. 2 mm. latum gradatim vel abrupte contractis, subtus secus costam cum setis adpressis numerosis 0.5–0.8 mm. longis ornatis alibi glabris, supra glabris, margine setas adpressas vel ascendentes gerentibus; floribus caulinis saepissime extra-axillaribus; pedicellis 10–15 mm. longis

gracilibus strigosis; corolla alba, limbo 7–9 mm. diametro; calyce 4–5 mm. longo basim versus lobato fructifero vix accrescente, lobis oblongis secus lineam centralem strigosis alibi glabris quam tubo corollae subduplo longioribus; ovulis 8–10; nuculis 8–10 plus minusve pallidis laevibus, a latere visis ca. 1.1–1.4 mm. altis et 0.8–1 mm. latis paulo infra medium latioribus, margine ventrali rectis erectis, dorso rotundis (haud angulatis), nuculis *ab apice visis* cuneatis ad 0.5 mm. crassis, ventre acutis; cicatrice plus minusve obliqua vel subbasali elongata minuta imam ad basim carinae nuculae gesto; gynobasi concava vel subplana.

NORTHEAST NEW GUINEA: Sarawaket, Morobe Prov., 3600–3900 m., April 7, 1937, *Clemens 5989* (TYPE, Gray Herb.); Samanzing, Morobe Prov., 2400–2700 m., creeper, edge of bush, fl. white, Feb. 15, 1939, *Clemens sine no.* (G).

This plant has the habit and general appearance of *T. papuana, T. robusta* and *T. opaca,* but has the numerous nutlets of *T. procumbens.* Its habit is that of *Havilandia* but the polymerous gynoecium belongs to *Zoelleria.*

Trigonotis procumbens (Warb.), comb. nov.

Zoelleria procumbens Warburg, Bot. Jahrb. **17**: 28 (1893).

NORTHEAST NEW GUINEA: Finisterre mountains, 1400 m., creeping, Oct. 15, 1888, *Hellweg 331* (TYPE, Berlin); Sarawaket, 2400–2700 m., 1937, *Clemens 5987* (G); Samanzing, Morobe Prov., creeper, wet ground, steep mountain, 1500–1800 m., Sept. 23, 1938, *Clemens 8862* (G).

Trigonotis minuta (Wernh.) Johnston, Contr. Gray Herb. **81**: 81 (1928).

Lithospermum minutus Wernh. Trans. Linn. Soc. London, ser. 2, **9**: 118 (1916).

Plagiobothrys minutus (Wernh.) Johnston, Contr. Gray Herb. **73**: 68 (1924).

This species remains known from a tiny inadequate specimen collected by Kloss, between 3100 and 3700 m., on Mt. Carstensz, Dutch New Guinea, during the Wollaston Expedition of 1912–13. The fruit is not known.

Trigonotis robusta (Johnston), comb. nov.

Havilandia robusta Johnston, Jour. Arnold Arb. **16**: 191 (1935).

Known only from the type (*Brass 5681*) collected at 3680 m., Mt. Albert Edward, British New Guinea.

Trigonotis opaca (Johnston), comb. nov.

Havilandia opaca Johnston, Jour. Arnold Arb. **16**: 190 (1935).

Known only from the type collected by *Brass no. 4178,* in the Murray Pass, Wharton Range, 2840 m., British New Guinea.

Trigonotis borneensis (Stapf), comb. nov.

Havilandia borneensis Stapf, Trans. Linn. Soc. London, ser. 2, **4**: 209, tab. 16 (1894).

Lithospermum borneense (Stapf) Boerl. Handl. Fl. Nederl. Ind. **2**: 488 (1899).

Plagiobothrys borneensis (Stapf) Johnston, Contr. Gray Herb. **73**: 68 (1924).

Known only from the higher altitudes on Mt. Kinabalu, British North Borneo, where it has been found by various collectors.

Trigonotis papuana (Hemsl.), comb. nov.

Havilandia papuana Hemsley, Kew Bull. **1899**: 107.

British New Guinea: Mt. Albert Edward, 3680 m., *Brass 4245* (G). Northeast New Guinea: vicinity Samanzing, upper camp, prov. Morobe, 2400–2700 m., creeping, marshy grassland with *T. pleiomera,* Feb. 15, 1939, *Clemens sine no.* (G). Dutch New Guinea: Mt. Wilhelmina, 3800–4100 m., among grass-tussocks, wet soil, Sept. 1938, *Brass & Myer-Drees 10042, 10105, 10106* and *10215* (G); Lake Habbema, 3225 m., sandy banks of grassland streams, Aug. 1938, *Brass 9176* (G).

This species was originally based upon collections made from British New Guinea, obtained on Mt. Scratchley, 3660 m., and in the Wharton Range at 3330 m. Possibly also referable to this species is a collection (*Kjellberg 3911*) at Buitenzorg collected at 3200 m. in central Celebes. The habit of this plant is certainly that of the present species but no nutlets have been seen and the identification must remain doubtful.

Cryptantha Milobakeri, sp. nov.

Planta erecta herbacea annua 2–4.5 dm. alta; caulibus viridibus ramos plures rigidos stricte ascendentes elongatos proferentibus pilis rigidis saepe 0.3–0.8 mm. longis et setis divaricatis 0.5–1 mm. longis sparsioribus ornatis; foliis caulinis viridibus 1–3 cm. longis 1.5–5 mm. latis lineari-oblongis vel lineari-lanceolatis, setis rigidis ascendentibus vel erectis e basi pustulata orientibus ca. 1 mm. longis obsitis; cymis terminalibus ebracteatis, eis caulis et ramorum majorum geminatis vel non rariter ternatis juventate brevibus et densis mox elongatis 5–15 cm. longis dissitifloris; calyce fructifero saepe pallide sericeo-villoso ca. 4 mm. (rariter ad 5 mm.) longo ascendente, lobis lanceolatis (apice conniventibus) pilis multis gracilibus mollibus adpressis ad 1 mm. longis

saepe conspicue vestitis, costa inconspicue debiliterque armata, setis costae pilis partium reliquarum lobi similibus saepe adpressis, basi calycis saepe oblique attenuata rariter subrotundata ad 0.5 mm. longe pedicellata; corolla 2–4 mm. diametro 2.5–4 mm. longa; ovulis 4; nuculis saepe solitariis et abaxialibus rariter 2–4, lanceo-ovatis laevibus nitidis inconspicuissime vel haud granulatis 1.8–2.5 mm. longis 1–1.2 mm. latis, dorse convexis, margine rotundis, ventre obtusis, sulco clauso basim versus furcatis; stigmate ⅔–¾ altitudinis nuculae attingenti.

CALIFORNIA: burnt region along Bottle Rock road, Lake Co., May 16, 1936, *Milo S. Baker 8268* (G); open places in chaparral about midway between Kelseyville and Lower Lake, Lake Co., May 5, 1934, *Milo S. Baker 7629* (TYPE, Gray Herb.); southeast side of Snow Mt., above Bonnie View, Lake Co., shale in Yellow Pine Belt, June 7, 1919, *Heller 13236* (G); between Mud Flat and Bennett Spring, on Newville-Covelo road, Glenn Co., northerly slope, open gravelly places, 2500 ft., June 5, 1915, *Heller 11928* (G); at river-bridge near Redding, Shasta Co., gravel and sand, May 29, 1905, *Heller 7883* in pt. (G); New River Bluffs, Trinity Co., warm rocky slopes, 1500 ft., Jan. 28, 1923, *Tracy 6388* (G); New River Bluffs, 1400 ft., April 27, 1924, *Tracy 6659* (G); hills west of mouth of South Fork of Trinity River, Humboldt Co., 2000 ft., among scattered brush especially on serpentine, June 14, 1932, *Tracy 10141* (G); hills west of South Fork Trinity River, near mouth, 2100 ft., prairies on hill and in open woods, June 10, 1936, *Harris & Tracy 3270* (G); Supply Creek, west of Hoopa Valley, Humboldt Co., 1000 ft., sunny warm slope, May 15, 1927, *Tracy 8050* (G); Grouse Mt., Humboldt Co., 4700 ft. edge of brush in grassy open country, June 27, 1934, *Tracy 11060* (G); Smith River, Del Norte Co., abundant along roadsides and on open gravelly prairie lands, June 4, 1937, *Parks 24011* (G).

This plant of northwestern California is most closely related to *C. grandiflora* Rydb., which ranges in the warm valleys of the Snake River and its tributaries in western Idaho and adjacent Washington and Oregon, and in the upper John Day Valley in northeastern Oregon. The Californian plant is taller, more freely branched, and very much less bristly, and its corollas are distinctly smaller than in its northern relative. The weakly differentiated usually appressed trichomes on the calyx-ribs, the relatively well developed corollas, the usually solitary broad polished nutlet, and the well developed geminate or ternate naked cymes serve to characterize the species. The specimens of *C. Milobakeri* from the eastern slopes of the Coast Ranges are very uniform and distinctive. The calyx is appressed villous and somewhat silky and the ribs have no well developed bristles. The material from Humboldt County,

however, is less extreme. Plants from this latter area tend to have the trichomes borne on the calyx-ribs weakly differentiated and somewhat coarser and less appressed than those borne on the other parts of the calyx.

In my monograph of the genus the present plant was included in *C. Hendersonii.* Subsequent study, however, has shown my former concept of *C. Hendersonii* to be complex and that, most certainly, forms with smooth and forms with roughened nutlets were improperly associated under one species. The names *C. grandiflora* and *C. Milobakeri* cover most of the smooth-fruited plants formerly referred to *C. Hendersonii* (Nels.) Piper. There remains, however, two other smooth-fruited plants, the poorly understood *C. incana* Greene from the southern Sierras (Tulare Co.) and *C. trifurca* Eastw., of Siskiyou County. These are probably distinct. I know them, however, only from the type-collections.

Cryptantha crymophila, sp. nov.

Herba perennis; caulibus pluribus 1.5–3 dm. altis erectis simplicibus minute villosis et hirsutis; foliis griseis cum pilis minutis villosis plus minusve vestitis et cum setis 2–3 mm. longis e basi minuta pustulata orientibus obsitis, in facie inferiore (et non rariter secus marginem folii) setis ascendentibus vel erectis (alibi adpressis) donatis; foliis inferioribus elongatis 7–9 cm. longis spathulato-oblanceolatis in tertia parte superiore latioribus 7–9 mm. latis deinde basim versus gradatim attenuatis apice obtusis; foliis caulinis superioribus oblanceo-ligularibus vel ligularibus 4–5 cm. longis 4–5 mm. latis acutis cymulas infimas valde reductas suffulcientibus et eas conspicue (saepe 3–5-plo) superantibus; cymis glomeratis supra medium caulis gestis, inferioribus reductis inconspicuis distantibus deinde sursum gradatim majoribus, supremis maximis (rhachibus cymarum maturum 5–15 mm. longis) 3–7-floris congestis partem principalem inflorescentiae fructiferae 2–3 cm. crassam formantibus; corolla alba ca. 8 mm. longa, limbo ad 5 mm. diametro; calyce ad anthesin ca. 5 mm. longo, lobis lineari-oblongis apice altitudinem appendicularum faucium corollae attingentibus; calyce fructifero accrescente 13–15 mm. longo, lobis subaequalibus elongatis quam nuculis ad 3-plo longioribus basim versus ca. 2 mm. latis deinde apicem versus gradatim attenuatis in margine et costa inconspicua setas sparsas 2–4 mm. longas pungentes gerentibus alibi sparse inconspicueque villosis (pilis 0.4–1 mm. longis), basi calycis maturi rotunda 1–2 mm. longe pedicellata; nuculis 4 in ambitu ovatis 4.5–5 mm. longis et 3 mm. latis, margine 0.25 mm. late alatis, basi rotundis, apice obtusiusculis, dorso irregulariter rugosis (rugis prominentibus interruptis plus minusve trans-

versis), ventre laevibus, sulco anguste aperto subulato a basi fere apicem corporis veri nuculae attingente; gynobasi subulata nuculis subaequilonga; stigmate apicem nuculae fere ad 1 mm. superante.

CALIFORNIA: Red Peak, Alpine Co., July 28, 1939, *R. F. Hoover 4193* (TYPE, Gray Herb.).

This very well marked species is most closely related to *C. nubigena* (Greene) Payson, of the southern Sierras. It differs from its relative in its taller habit of growth, its less firm more elongate leaves, its very large more elongate fruiting calyces, and its much larger ovate (rather than oblong) definitely winged-margined more prominently rugose nutlets. The type was collected on Red Peak which lies about seven miles west-northwest of Sonora Pass. Payson reports *C. nubigena* from Sonora Pass, and I have seen a coarse form of the species (*Sharsmith 2902*) from Leavitt Peak, a few miles south of the Pass. *Cryptantha nubigena,* like various other alpine plants of the southern Sierras, may reach its northern limit at Sonora Pass. The new species is perhaps a more northerly ranging plant which reaches its southern limit near the same floristic boundary.

According to Mr. Hoover, *Cryptantha crymophila* grows in loose rocks about the summit of Red Peak (about 9950 ft.) down to about 9500 ft. altitude. Associated species include *Lupinus meionanthus, Senecio canus* and *Erigeron compositus.* Red Peak is composed of dark, fine-grained rock said to be of volcanic origin. Some scattered shrubs of *Pinus albicaulis* grow up to the very summit. Mr. Hoover writes me that he collected the present species on the adjacent Bald Peak in 1936. The material, however, was in early flowering condition.

Cryptantha capitata (Eastw.), comb. nov.

Orcocarya capitata Eastwood, Leaflets West. Bot. **1**: 9 (1937).

This relative of *C. confertiflora* (Greene) Payson remains known only from the localities in the Grand Canyon where it was originally found by Miss Eastwood.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

NEW PHANEROGAMS FROM MEXICO. II*

IVAN M. JOHNSTON

Atriplex abata, sp. nov.

Herba monoica prostrata pallida e radice palari gracili 2–4 mm. crassa ut videtur perenni oriens; caulibus pluribus 1–3 dm. longis laxe ramosis pallidis internodiis 1–3 (saepe 2) cm. longis; foliis inferioribus (2–4) caulis ramorumque oppositis ceteris alternis; lamina ovata vel elliptica integra vel serrulata vel inconspicue irregulariterque pauciserrata 1–2.5 cm. longa 0.8–1.8 cm. lata inconspicue costata, apice obtusa vel rotundata, basi obtuse angulata (nullo modo cordata vel hastata), in petiolum 2–4 mm. longum abrupte contracta; floribus masculis et femineis intermixtis in axillis foliorum superiorum ramorum glomeratis, supremis spicas terminales interruptas 1–2 cm. longas plus minusve formantibus; bracteis femineis orbicularibus vel late orbiculari-ovatis 2–4.5 mm. latis 3–5 mm. longis, basi cordatis vel rariter rotundis in stipitem 0.2–0.9 mm. longum abruptissime contractis, margine subherbacea 0.3–0.8 mm. lata ca. 11-dentata, dente terminali paulo majore triangulari 0.5–1 mm. longo, corpore bracteae pallido rugoso prominenter congesteque crasse trinervato sparse tuberculato; seminibus ca. 1.2 mm. latis et longis, radicula lateraliter erecta; stylo ca. 1.2 mm. longo brunneo usque ad basim lobato.

SAN LUIS POTOSI: San Miguel, common on alkaline flat with *Suaeda* and *Peganum*, prostrate, 1.5–10 dm. broad, Sept. 12, 1938, *Johnston 7617* (TYPE, Gray Herb.). COAHUILA: about 18 km. north of La Ventura, alkaline flat, prostrate, common locally, Sept. 13, 1938, *Johnston 7648* (G).

This very well marked species was locally common on saline flats at the two stations where it was observed. These stations are in the region where the boundaries of San Luis Potosi, Zacatecas and Coahuila meet. The type collection, from near San Miguel, came in fact from close to the Zacatecas–San Luis Potosi boundary, and since the exact location of the line was not determined, the collection may have actually come from Zacatecas rather than from San Luis Potosi as given. In the treatments of *Atriplex* by Standley (1916) and by Hall (1923), this new species keys out to *A. elegans* (Moq.) Dietr. That species ranges from Texas to California and in adjacent Mexico and is an erect plant with small

*NEW PHANEROGAMS FROM MEXICO. I. See Jour. Arnold Arb. 20: 234. 1939.

narrow consistently alternate leaves and nearly smooth more flattened fruit-bracts. The prostrate herbaceous habit of *A. abata,* as well as its opposite lower stems and leaves, its nearly entire ovate leaves, and its radially toothed herbaceous-margined bracts with more or less cordate base and rugose and sparingly tuberculate sides, are all characters which permit the ready recognition of this species.

Drymaria elata, sp. nov.

Planta perennis fruticulosa 2–4 dm. alta erecta e radice crassa lignosa palari oriens; caulibus erectis vel ascendentibus glabris plus minusve glaucescentibus ascendenter ramosis basim versus 2–3 mm. crassis lignosis internodiis 2.5–8 cm. longis; foliis linearibus carnosis compressis 2–7 cm. longis 0.5–1.2 mm. latis superioribus gradatim reductis glabris glaucis exstipulatis; inflorescentia terminali capitato-umbellata 5–10-flora inconspicue minuteque bracteata maturitate ca. 1.5 cm. diametro 4–10 cm. longe pedunculata; pedicellis 1–6 mm. longis sparse stipitato-glanduliferis, maturitate divergentibus vel reflexis; sepalis late orbicularibus 3–4.5 mm. longis, apice obtusis, margine anguste albo-marginatis, dorso sparse stipitato-glanduliferis glabris; petalis 5, 3 mm. longis haud unguiculatis late affixis; parte integra petali 2 mm. longa ovata infra medium latiore 1.5 mm. lata basi rotundata margine minute fimbriata apice truncata lacinias 0.5–1 mm. longas lateralibus quam interioribus longioribus gerente; filamentis 5 subulatis ad 3 mm. longis glabris; capsula ovoideo-globosa 3–4 mm. crassa, valvis saepe 3 rariter 2–4; stylo ca. 1 mm. longo 2–3-lobato; seminibus numerosis dorso pilos breves crassos abundanter gerentibus.

COAHUILA: 10 km. south of Laguna del Rey, locally abundant in gypsum silt, Sept. 21, 1938, *Johnston 7823* (TYPE, Gray Herb.); Sierra del Rey, June 1910, *Purpus 4496* (G).

This plant is related to *D. suffruticosa* Gray and agrees with that species in general habit and vegetative structures, as well as in the non-development of definite stipules. It differs in its capitately congested umbellate cymes with minute bracts, in the presence of scattered glands on the pedicels and sepals, and in the shape and size of the petals. The petals are ovate or oblong and broadest near the base. They are not flabellate, broadest above the middle and contracted to a claw below, nor so deeply and conspicuously lacerate as are those of *D. suffruticosa.*

Drymaria lyropetala, sp. nov.

Planta perennis fruticulosa glabra subglaucescens e radice valida palari erumpens, 1–2 dm. alta; caulibus gracilibus congestis numerosis ramosissimis erectis vel ascendentibus basim versus 0.3–1 mm. crassis

internodiis 1–3.5 cm. longis; foliis carnosulis linearibus compressis 5–15 mm. longis 0.5–1.1 mm. latis acutis exstipulatis; inflorescentia terminali laxe cymosa 3–5-flora ramis saepe 1–2 cm. longis, bracteis 1–3 mm. longis; pedicellis gracilibus 2–4 mm. longis; sepalis lanceo-ellipticis 4.5–5 mm. longis 2–2.5 mm. latis paulo infra medium latioribus apice acutis margine evidenter albo-marginatis dorso glabris non rariter sparse glanduliferis; petalis 5 albis 6 mm. longis lyriformibus, infra medium simplicibus oblongis 1–2 mm. latis medio-nervatis margine tantum lacerato-denticulatis basi late affixis, supra medium conspicue lacerato-lobatis, lobulis lateralibus lineari-subarcuatis longissimis ca. 3 mm. longis, lobulis interioribus linearibus 1.5–2 mm. longis; filamentis 5 cuneatis 4.5–5 mm. longis imam ad basim 0.8 mm. latis; capsula 2–3 mm. crassa late ovoidea, valvis saepe 3 (rariter 2 vel 4); stylo 2.6 mm. longo apice saepe 3-lobato, lobis 0.5 mm. longis recurvatis; seminibus numerosis dorso pilos breves erectos conspicue gerentibus 1 mm. longis 0.8 mm. altis 0.6 mm. latis a latere viso perforatis.

COAHUILA: 1.5 km. south of Hermanas, locally common in heavy alkaline soil, Aug. 24, 1938, *Johnston 7064* (G). SAN LUIS POTOSI: 3.5 km. south of Cedral, gypsum plain, locally common, Sept. 11, 1938, *Johnston 7594* (TYPE, Gray Herb.); 63 km. south of Matehuala (ca. 16 km. n.w. of Huizache), frequent on gypsum flats, Sept. 10, 1938, *Johnston 7513* (G).

Related to *D. suffruticosa* Gray and *D. elata* Johnston, with which it agrees in having the curved seeds hairy on the back. All three species have an erect fruticulose habit and suppressed stipules. The bases of the opposed leaves are very narrowly joined. Rarely on vigorous shoots very minute shortly persistent lobules may be detected at the bases of the leaves. These may represent the stipules. In gross habit *D. lyropetala* much suggests a *Spergularia*. It differs from *D. suffruticosa* in its small size, broadly attached lyre-shaped (rather than clawed, flabellate) petals, and less coarsely hairy seeds. From *D. elata* it differs in gross habit and petal shape. The two collections of *D. lyropetala* from San Luis Potosi are similar in aspect and details. The collection from Coahuila, however, is slightly coarser and perhaps more glandular but is otherwise similar to the more southern plants.

Scopulophila Parryi (Hemsl.), comb. nov.

Achyronychia Parryi Hemsl. Diag. **2**: 36 (July 1879).
Achyronychia Palmeri Hook. in Benth. & Hook. Gen. Pl. **3**: 15 (Feb. 1880).

The genus *Achyronychia* was based upon *A. Cooperi* T. & G., of the California deserts. Subsequently two other species were described, the

present plant of the intermontane deserts of northern Mexico, and later, *A. Rixfordii* Brandg. of the deserts of southern Nevada and adjacent California. These three species differ greatly in appearance. Two generic names have been proposed for *A. Rixfordii* Brandg., namely *Scopulophila* Jones (1908) and *Eremolitha* Jepson (1914), and there are good reasons for accepting it as generically distinct from *Achyronychia Cooperi* Gray, as is now the general practice in western United States. No one, however, has discussed the relation of the remaining Mexican species to *Achyronychia Cooperi* and *Scopulophila Rixfordii*. A study of this matter shows that the Mexican species has its closest relations with *S. Rixfordii* as may be appreciated by the following key.

Carpels 2; staminodes numerous, minute, a fringe of minute lobes extending between the 2–5 stamens, not springing from thickened glandular tissue; plant distinctly annual; leaves of each pair distinctly unequal in size; dry hot sands and gravels of the Colorado and Mohave deserts in California, Arizona and adjacent Mexico (ACHYRONYCHIA T. & G.) ..... *Achyronychia Cooperi* T. & G.

Carpels 3; staminodes 5, narrowly triangular or subulate, alternating with the 5 stamens and springing from a thickened ring of glandular tissue; plant a strong perennial; leaves of each pair equal in size (SCOPULOPHILA Jones).

Styles with 3 distinct lobes; sepals mostly scarious, having only a small central herbaceous area; plant erect; root crowned by abundant crowded lacerate stipules forming a "hairy cushion" from which the stems emerge; leaves nearly linear; rocky places, deserts of southern Nevada and adjacent California. ..... *Scopulophila Rixfordii* (Brandg.) Munz & Johnston.

Styles unlobed; sepals mostly herbaceous, with only a scarious margin; plant prostrate, no "hairy cushion" at base; leaves lanceolate to nearly elliptic; under thorny shrubs and cacti, deserts of Mexico (Coahuila to San Luis Potosi; Puebla). .... *Scopulophila Parryi* (Hemsl.) Johnston.

Mortonia latisepala, sp. nov.

Frutex 1–3 m. altus sparse stricteque ramosus; foliis oblanceolatis 1–2 cm. longis 3–6(–8) mm. latis cum pilis brevibus rigidis crassis utrinque scabridis margine incrassatis vel plus minusve revolutis; inflorescentia diffuse cymosa ramulis scabridis; calyce extus scabrido; sepalis late deltoideo-semicircularibus ca. 2 mm. latis et 1.3 mm. longis in parte tertia centrali triangulari herbacea ceteris membranaceis, margine denticulatis apice breviter acuminatis; petalis albis ovatis 3 mm. longis quam sepalis subduplo longioribus ad 2 mm. latis margine denticulatis basim

subsessilem versus abrupte rotundato-contractis; filamentis subulatis ad 1 mm. longis, antheris ad 0.3 mm. longis; margine disci floris obscure paucisinuato ad 1 mm. alto; fructu ellipsoideo 2.5–3 mm. longo 2–2.5 mm. crasso sepalos breviter superante, stylo rigido 1–1.5 mm. longo apice obscure 5-lobato coronato.

COAHUILA: in arroyo near El Puerto de San Lazaro, June 15, 1936, *Wynd & Mueller 100* (TYPE, Gray Herb.); Sierra Gavia, 8 km. north of Saucillo, dry rock slope in crevices, slender strict shrub with few elongate strict branches, 1–3 m. tall, Aug. 28, 1939, *Johnston 7213* (G).

The type of this species has been determined as *M. hidalgensis* Standley, but that southern species has smaller (ca. 2 mm. long) petals which equal or are even surpassed by the elongate triangular acuminate (ca. 1.5 mm. wide and 2.5 mm. long) sepals. Furthermore the leaves of *M. hidalgensis* are much less scabrous and the inflorescence smaller and more elongate than in *M. latisepala*. This plant of Coahuila is probably most closely related to *M. Greggii* Gray, of Nuevo Leon, which has the same general habit and similar broad sepals, but smaller petals and smooth leaves.

Mentzelia pachyrhiza, sp. nov.

Herba annua scabrida 1–2 dm. alta; radice ad apicem conspicue abrupteque incrassato, parte succulenta 2–3 cm. longa et 1 cm. crassa; caulibus paucis sparse ramosis cortice candida scabrida obtectis; foliis scabridis alternis, lamina deltoideo-ovata 15–20 mm. longa 12–16 mm. lata conspicue irregulariterque dentata (rariter subtrilobata) vel grosse sinuata, basi obtusa in petiolum 4–6 mm. longum gracilem scabrum pallidum abrupte contracta, apice acuta vel obtusa; floribus terminalibus vel axillaribus haud numerosis in cymas terminales paucifloras laxe dispositis; sepalis basim versus 1 mm. latis deinde apicem versus gradatim attenuatis scabridis erectis; petalis 5 flavis ca. 1 cm. longis et 8 mm. latis sepalos ad 4 mm. longe superantibus, lamina medium versus latiori late elliptica evidenter nervata, basi in unguem 1.5 mm. latum et ca. 1 mm. longum contracta, apice in acumen triangulare pilulosum ad 0.5 mm. longum abrupte attenuata; staminibus ca. 25 filiformibus homomorphis 2–3-seriatis, brevissimis ca. 4 mm. longis, longissimis ad 6 mm. longis; antheris latioribus quam longis 0.6–0.8 mm. latis; fructu subcylindraceo vel clavato-cylindrico 8–11 mm. longo saepe ca. 2 mm. crasso saepe sessili vel rariter usque ad 1.5 mm. longe stipitato; seminibus paucis (saepe 4) pendulis nigris 2.5–3.5 mm. longis ca. 1.5 mm. crassis irregulariter angulatis exalatis conspicue irregulariterque rugoso-tuberculatis et minute sed distincte multisulcatis.

COAHUILA: 18 km. north of Parras, foot of steep sandstone slope, Sept. 16, 1938, *Johnston 7717* (TYPE, Gray Herb.); 5 km. east of Cuatro Cienegas, loose gravelly soil on hillside, Aug. 25, 1938, *Johnston 7112* (G).

This species is related to *M. oligosperma* Nutt. of the region from South Dakota to Colorado and Texas, but is quickly separable from that northern plant by its long petioles, white stems, and simple, apparently annual root. Just below the surface of the soil the root becomes abruptly enlarged to form a fusiform or narrowly ellipsoidal mass of fleshy storage tissue. A single sparsely branching stem arises from the summit of this thickened portion of the root and the slender simple taproot continues down from its base. It is unique in the genus.

Lycium leiospermum, sp. nov.

Frutex glaber 3–15 dm. altus validus rigidus erectus divaricate ramosissimus; ramis griseis spinescentibus; foliis fasciculatis glabris plus minusve glaucescentibus crassis succulentis compressis linearibus vel oblanceolatis 5–13 mm. longis 1–2 mm. latis ecostatis subsessilibus apice obtusis vel rotundis, in sicco conspicue longitudinaliter rugosis; calyce sub anthesi glaberrimo 4–5 mm. longo ca. 1.4 mm. crasso cylindrico tricarinato basi in pedicellum triquetrum 5–6 mm. longum abrupte attenuato, lobis 3 acutis triangularibus ca. 1.5 mm. longis carinatis; calyce fructifero plus minusve explanato (tubo postice fisso) late albomarginato, lobis 3–4 mm. latis et longis, pedicello recurvo ca. 10 mm. longo; corolla cylindrica ca. 1.1 cm. longa glabra, tubo imam ad basim aliquantum bulboso ca. 1 mm. supra basim angustissimo (ca. 1.2 mm. crasso) deinde sursum gradatim ampliato summo ad apicem ca. 2 mm. crasso; tubo lobos calycis 2–3 mm. longe superante; lobis corollae 5 patentibus oblongis 3 mm. longis ad 1.4 mm. latis apice obtusis; filamentis exsertis 5, ca. 5 mm. supra basim tubo corollae affixis basim versus villosis; antheris oblongis ca. 1.5 mm. longis; bacca rubra ovoidea 7–9 mm. longa 5–8 mm. lata glabra; seminibus numerosis (ca. 50) flavescentibus laevibus 1–1.5 mm. longis plus minusve angulatis irregularibus.

COAHUILA: saline flats 13 km. north of Avalos, with *Suaeda, Atriplex Isocoma* etc., a frequent rigid spinescent shrub 3–9 dm. tall, berries red, Sept. 2, 1938, *Johnston 7336* (G). SAN LUIS POTOSI: 28 km. northwest of Cedral, local in depressions on silty desert plain, bush 5–15 dm. tall, leaves fleshy glaucous, berries red, Sept. 12, 1938, *Johnston 7611* (TYPE, Gray Herb.).

This plant keys out in C. Leo Hitchcock's monograph to *L. Andersonii* Gray, a species of southwestern United States and adjoining north-

western Mexico, and seems to be most closely related to that western species. It differs, however, in its smooth, rather than roughened seeds, in its firmer sharply and regularly 3-toothed calyx which at maturity, though accrescent, splits down one side and becomes more or less explanate, and in its pale green somewhat glaucous entirely glabrous more succulent leaves. The two specimens cited are in mature fruiting condition. The corolla is described from old flowers found adhering to the type specimen.

Lycium modestum, sp. nov.

Frutex depressus 1.5–3 dm. altus 3–9 dm. latus; ramis horizontalibus non rariter radicantibus divaricate ramosis rigidis, internodiis 2–8 mm. longis; ramulis numerosis rigidis spinescentibus saepe ca. 5 cm. longis juventate glandulari-pubescentibus mox glabrescentibus; foliis fasciculatis oblanceolatis 5–10(–12) mm. longis 1.8–2 mm. latis compressis haud succulentis glandulari-pubescentibus apice rotundis; floribus saepe solitariis e fasciculis orientibus; calyce 6–7 mm. longo glanduloso-pubescente basi conica in pedicellum 3–4 mm. longum attenuato, lobis elongatis ascendentibus compressis subinaequalibus 4–5 mm. longis ad 1 mm. latis maturitate paulo accrescentibus apice obtusis vel acutis sinus corollae attingentibus vel eos ad 1 mm. longe superantibus; corolla lilacina infundibuliformi 8–9 mm. longa extus sparse glanduloso-pubescente, limbo ad 8 mm. diametro, lobis 5 ellipticis vel ovato-oblongis (medium versus latioribus) 2.5–3 mm. longis et 2 mm. latis ascendentibus; tubo corollae imam ad basim bulboso 1–1.5 mm. supra basim angustissima (ca. 0.6 mm. crasso) deinde sursum gradatim ampliatis (faucibus vix differentiatis) infra sinus loborum ad 3 mm. diametro, intus basi filamentorum pubescente alibi glabro; staminibus exsertis ad 4 mm. supra basim corollae affixis; filamentis 3.5 et 4.5 mm. longis subulato-filiformibus glabris; bacca rubra glabra obovoidea ad 4 mm. crassa 5 mm. longa; seminibus 8 irregularibus angulatis scrobiculatis 2–2.5 mm. longis.

San Luis Potosi: desert about 13 km. northwest of Cedral, silty sloping plain, a depressed low bush with spreading rooting stems, in the shelter of *Larrea* and *Flourensia* bushes, locally common, corolla lavender, Sept. 12, 1938, *Johnston 7605* (type, Gray Herb.).

In Hitchcock's monograph this unusual species keys out with *L. minimum* Hitchc., of the Galapagos Islands, and with *L. Richii* Gray, of the coastal regions of Sonora and California. It is widely different from both, and conspicuously so in its pubescence and depressed habit. The younger branches, leaves, calyx and the outside of the corolla bear

numerous though scattered short erect multicellular gland-tipped hairs which much suggest, in quantity and quality, those found on *L. Parishii* Gray. The species is a very distinct one.

Zinnia oligantha, sp. nov.

Planta fruticosa dense stricte ramosissima erecta 1.5–4 dm. alta; ramis longe stricteque ramosis congestis foliosissimis (internodiis saepe 3–10 mm. longis) juventate albide adpresseque tomentellis vetustis glabratis; foliis oppositis 1–2 cm. longis 0.5–1.5(–2.5) mm. latis sparse tomentellis mox glabrescentibus linearibus vel anguste oblanceo-linearibus supra medium latioribus deinde basim versus gradatim attenuatis apice obtusiusculis faciebus rugulosis mediocostatis sparse glanduloso-punctatis margine plus minusve incrassatis pallidis denticulatis; capitulis apicem ramorum et saepe ramulorum gracilium paucifoliatorum 1–4 cm. longorum e axillis foliorum parium 1–3 supremorum rami orientium terminantibus, sessilibus vel usque ad 1 cm. longe gracillimeque pedunculatis; involucro elongato 5–7 mm. longo 1.5–2 mm. crasso; tegulis 8–10 (? spiralibus vel ? 3–4 seriatis) obovatis vel oblongis 3–7-nervatis scariosis, apicem obtusum villoso-ciliatum versus herbaceis glanduliferis; floribus ligulatis duobus albis, lamina ad 9 mm. lata et longa e basi 10–12-nervata apice 0.5–1 mm. profunde emarginata, achaeniis juventate 4-angulatis maturitate compressis bifacialibus ad 5 mm. longis et 1.7 mm. latis multicostatis (costa mediali validiore) minute inconspicueque muricato-tuberculatis nigrescentibus, aristis pappi 4 subulatis haud 0.5 mm. longis; floribus tubularibus 2–4 vel rariter 5 flavis ca. 5 mm. longis infra lobos ca. 0.5 mm. crassis deinde basim ca. 0.2 mm. crassam versus gradatim attenuatis, lobis ca. 1 mm. longis oblongo-triangularibus flavis intus pilis brevibus crassis flavis ciliatis, achaeniis ca. 3 mm. longis juventate 4-angulatis maturitate plus minusve compressis glabris, arista pappi solitaria rigida ad 1 mm. longa; paleis lanceolatis scariosis acutis apicem versus non rariter glanduliferis et plus minusve viridibus.

COAHUILA: El Toro near Movano [Mohovano], July 1910, *Purpus 4469* (G); 21 km. south of Laguna del Rey on road to Mohovano, forming dense rounded shrubby masses 1.5–4 dm. tall on old dunes, Sept. 21, 1938, *Johnston 7821* (TYPE, Gray Herb.).

The two collections cited come from the region south of Laguna del Rey. They agree in all details and evidently represent another peculiar plant endemic to this remarkable area. The species is obviously related to *Z. pumila* Gray, but differs from that species in its very dense bushy habit, elongate few-flowered heads, and very broad ligulate corollas. The very elongate heads, regularly producing only 2 broad-limbed ray-florets, are unique in the genus.

Pectis incisifolia, sp. nov.

Herba prostrata glaberrima; ramis 5–30 cm. longis laxe longeque subdichotomo-ramosis, internodiis ad 5 cm. longis; foliis 1–4 cm. longis oppositis sessilibus saepe sparse sed conspicue anguste lobatis, lamina lineari 1–2 mm. lata, utrisque marginibus rariter sparse dentatis sed saepe lobis linearibus vel subulatis vel triangularibus rectis vel curvatis inaequalibus 1–3 mm. longis plus quam 2 mm. distantibus ornatis, apice loborum et dentium setifero vel subcuspidato; capitulis haud congestis apicem caulium et ramulorum terminantibus 1–6 mm. longe graciliterque pedunculatis; involucro cylindrico 5–6 mm. alto glabro, tegulis 8 sparse punctatis dorso rotundis basi gibbosis apice acutiusculis subscariosis inconspicue ciliolatis achaenea marginalia saepe amplectantibus; corollis ligularibus femineis fertilibus 8 flavis, lamina elliptica ca. 3.5 mm. longa et 1.6 mm. lata, tubo cylindrico ca. 1 mm. longo pilis sparsis capitatis ornato, stylo 1.8 mm. longo subglabro, lobis styli linearibus ca. 0.8 mm. longis; corollis tubulosis hermaphroditis ca. 12 flavis 3–4 mm. longis, tubo cylindrico pilis capitatis sparse ornato 0.3–0.4 mm. crasso 1.5–2 mm. longo, faucibus quam tubo subduplo crassioribus ca. 0.6 mm. longis, lobis oblongo-triangularibus 0.9–1.5 mm. longis acutis, stylo pilis antrorsis vestito apice incrassato subintegro; achaeniis homomorphis nigrescentibus compressis minute striolatis pilis capitatis sparsis ornatis, apice cupulam nigrescentem firmam minute denticulatam gerentibus (setas vel paleas nullo modo proferentibus).

Coahuila: just south of Laguna del Rey, prostrate in silty soil, locally common, Sept. 21, 1938, *Johnston 7824* (type, Gray Herb.). Chihuahua: about 8 km. northeast of Laguna Palomas, on old dunes, locally common, Sept. 21, 1938, *Johnston 7827* (G).

This remarkable species keys out to *P. angustifolia* Torr. in the treatment of the genus by Rydberg, N. Am. Fl. **34**: 196 (1916) and perhaps is most strongly related to that species. The relation, however, is not close. The new species is readily distinguished by its epappose achenes, its definitely prostrate elongate loosely branched stems, and its unique narrowly lobed leaves. The lobed leaves and the elongate loosely branched prostrate stems distinguish *P. incisifolia* from all its congeners. The species is another one of that remarkable group of endemics found centering in the region about Laguna del Rey. Populous very local colonies of the plant were found at the two stations cited. It was not seen elsewhere. The two stations are about 40 km. apart and lie on opposite sides of the Coahuila-Chihuahua boundary.

Arnold Arboretum,
Harvard University.

THIRTY-FIVE NEW SPECIES OF AMERICAN CROTON

LEON CROIZAT

THE RANGE of the species published or named as new in this paper extends from Mexico to Argentina. In preparing the manuscript, I have had the use of the unnamed *Croton* material of the U. S. National Museum, the Botanical Garden of Berlin, the Museum of Natural History of Stockholm, the Biological Institute of Saõ Paulo, and I have also taken full advantage of the material available in the collections of the Arnold Arboretum and Gray Herbarium of Harvard University, the New York Botanical Garden and the Brooklyn Botanical Garden. Loans of specimens and photographs were granted by numerous other institutions in the United States, in South America and in Europe, including the Botanical garden of Göttingen. During a trip to Europe in the winter of 1938–1939, I had the opportunity at least of seeing the historic types of the genus preserved in the herbaria of the Royal Botanic Gardens of Kew, the Museum of Natural History of Paris, the Conservatory and Botanical Garden of Geneva and the Botanic Garden of Bruxelles.

In a comparatively recent work, Pax & Hoffmann state (Nat. Pflanzenf. 19 [c]: 84. 1931) that the species of *Croton* are more than 600, of which two-thirds are endemic to tropical America. Even as it was being written, this estimate was wide of the correct total. A rough tabulation from the best available sources shows that there are about 1000 published species which may lay claim to the status of valid binomials. Of this number, America has 650 species, continental Africa 65 species, Madagascar 70 species,[1] India and south tropical Asia 65 species, Malaysia, Australia and Oceania 30 species. The American species are approximately distributed as follows: United States 30 species, Mexico 60 species, Central America 20 species, West Indies 140 species, Colombia and Venezuela 55 species, northern Brazil and the

[1]The present paper was already in the hands of the printer when a recent publication came to hand in which Léandri added 41 new species to the *Croton* of Madagascar (Ann. Mus. Col. Marseille, 5 sér., 7: 5–98. 1939), an increase of about 50% of the total. The significance of this accretion will be better understood considering that the area of Madagascar is less than one-tenth that of Brazil; that Madagascar has been much better explored botanically than the American republic and that the Brazilian domain is almost certainly richer in sectional forms of *Croton* than Madagascar.

Guianas 40 species, Ecuador, Peru and Bolivia 50 species, central and eastern Brazil 200 species, south Brazil, Uruguay and Argentina 50 species.

The West Indies rank next to Brazil in record, which suggests an interesting consideration. In 1866, Mueller Argoviensis recognized 63 species in the West Indies. Almost alone, Urban doubled this figure between 1898 and 1932, the great majority of these additions being good species.

Under the most conservative estimate, it is to be expected that scores of species are as yet unreported. Very few species of *Croton* have more than a regional distribution, it being characteristic that several species known before 1866 have not been collected, to my knowledge, in recent times. In the regions which have been better explored, two factors can be seen to influence active speciation, one regional, the other altitudinal. Of edaphic factors, of course, it is nearly impossible at present to speak, although it may be suspected that certain habitats are responsible for the occurrence of distinct forms. Species that at first glance seem to be widely distributed and fairly constant, turn out to be composed of slightly different forms which it becomes necessary to recognize as distinct. Illustrative of this condition is *C. flavens* which, as the binomial is now understood, may be said to occur in the West Indies, Yucatan, Colombia, Venezuela, Ecuador and Peru. Critically studied, this widespread entity is seen to include *C. ferrugineus, C. peraeruginosus, C. collinus, C. peltoideus, C. meridensis, C. rigidus, C. malacophyllus,* etc. there being no means of separating one form from the other, once too broad a specific concept is used. Thus the comprehensive area of dispersal of *C. flavens,* sensu lato, from Jamaica to Peru must be broken up and recognition granted to the local forms of the aggregate. It is characteristic that states or varieties of *C. flavens,* endemic to the West Indies, are almost identic with forms of *C. ferrugineus* localized on the mountains of Venezuela, the distributional range being one of the most important characters of specific differentiation. In the same manner, *C. pungens* from eastern Venezuela is hardly, if at all, to be separated from *C. sarcopetalus* of northern Argentina, except by range.

In his monograph on the *Croton* of the United States, Ferguson writes (Ann. Missouri Bot. Gard. **12**: 34. 1901) that the species of the genus do not admit of rigid definition. He remarks that while in a restricted locality few variations can be found, the forms that occur at the margin of the area of distribution are in habit noticeably different. The cited example of *C. flavens* and *C. pungens* fully confirm the inherent truth of these statements. My own experience in working with the genus over

a vastly greater range than the one studied by Ferguson is that even the major aggregates within *Croton* cannot be precisely defined, floral and vegetative characters being not infrequently in contrast. It seems impossible to understand the species in this genus otherwise than as a form which, grounded upon a phytogeographic and edaphic foundation, is recognizable in different collections by sums of positive not less than by negative characters and intangibles. Series and sections will eventually be defined by a concept that uses natural groups, understood along phylogenetic lines. The study of *Croton* is today in the initial stage, the thirty-five species that this paper adds to the record and the others to be published later, barely filling in some of the distributional and systematic gaps that have so far impeded the study of the genus.

The fragmentary conditions of present knowledge not less than the difficulty of corresponding with, and of securing material from European institutions since the outbreak of the pending war, make it advisable that this paper be strictly confined to a record of publication, leaving special and general revisions, elaboration of keys and detailed discussions to be presented in papers to follow. Much needed field study, of course, will remain as a legacy from present workers to coming generations of South American botanists and ecologists.

In the descriptions that follow, vegetative characters are first described at some length, followed next by an account of the major characters of the ♀ flower. The ♂ flower is seldom analyzed in detail, this being a departure from standards accepted by taxonomists on the authority of Mueller Argoviensis. Such departure requires an explanation.

The concept of a botanical family as a closely knit unit scarcely answers reality. In the Euphorbiaceae, for instance, at least three affinities can be traced: namely with the Sterculiaceae, the Sapindaceae-Celastraceae and the Malvaceae. The true Euphorbiaceae, about 4000 species out of a total of 8000 present in the family, constitute a fourth group which *Croton* typifies much more satisfactorily than *Euphorbia*.

In the true Euphorbiaceae, the ♂ flower is essentially of malvaceous pattern, that is to say, its androecium is basically to be considered as a staminal column. The ♀ flower, on the contrary, has characters of placentation, coats and arillode reminiscent of the sapindaceous and celastraceous aggregate.

In the malvaceous type of flower, *the petals are appendages of the staminal column* (Duchartre in Ann. Sc. Nat. Bot. sér. iii, 3: 123–150. 1845). They have a status, consequently, which is not unlike that of petaloid staminodes, i.e., of sterile stamens. In *Croton*, the staminal

column is solute and simulates an androecium of more or less numerous free stamens inflexed in vernation. The petals, obviously, are appendages of the androecium in this genus. They are fully developed in the flower in which the androecium is predominant (i.e. in the ♂ flower). They are mostly wanting in the flower in which the androecium is abortive and the gynoecium fully evolved (i.e. the ♀ flower).

Between the petaliferous ♀ flower of *C. alabamensis* and the pseudo-urticaceous ♀ perianth of *C. Bonplandianus*, all manner of intermediates occur. In these intermediates are found petals, ligulae, laciniae, staminodes, nectaries, tufts, fleshy tori of almost every conceivable description, all of which derive from the androecium by total or partial reduction. These relics are sometimes opposite the lobes of the calyx in which case they are shown to have been derived from the androecium proper. Just as often they are alternate with the lobes which indicates that they represent degenerate petals. Theoretically, differences in position as between sepals, petals and stamens are important. In *Croton*, however, these differences mean little because they are liable to represent merely individual variations.

The ♂ flowers of *Croton* are remarkably uniform in structure, the chief differences between those of the various species and groups being the approximate number of the stamens and the length and indument of the petals. The ♀ flower is more variable and much more important to the taxonomist. It is prevailingly apetalous and 5-lobed, as state above, and it is to be understood as such, barring statement to the contrary, in the coming descriptions. The style, like in most Euphorbiaceae, is at least 3-partite to, or very nearly to, the base.

To conform with the recommendations of the latest International Congress (Syn. Prop. Sixth Intern. Bot. Cong. 57. 1935; Proceed. Sixth Intern. Bot. Congr. 1: 356–57. 1936) the generic name *Croton* is treated as masculine, which is its classic gender.

MEXICAN SPECIES

Croton escathos, sp. nov.

Fruticulus dumosus, intricatim ramosus, cortice vetustiore rimis crebris albicante, caulibus florigeris subherbaceis pilis raris fasciculatis hinc inde pubescentibus. Folia supra brunnea, subtus olivacea, 2–1.5 cm. longa, 0.8–0.6 cm. lata, elliptica, apice rotundata, basi cuneata, pilis fasciculatis habitu setulosis parcius indutà, margine denticulato-serrata, serraturis potius revolutis incrassatis quam revera glandulosis; venis tenuissimis eximie triplinerviis; petiolo gracillimo ca. 1 cm. longo apice

eglanduloso. Cymae subcapitulatae, parte foeminea aggregata, mascula habitu filiformi, ad 3 cm. longae. Flores ♀: primo intuito valde glanduloso-pilosi; calyce ad basim partito, 0.7 cm. longo, 0.5 cm. lato, pedicello subclavato ad 1.2 cm. longo, lobis 0.6 cm. longis, 0.15 cm. latis, vulgo ligulatis, acutis, extus undique processibus laciniosis, apice sub lente glandulosis substellatim partitis, onustis; ovario ellipsoideo-trigono, 0.2 cm. magno, parcius hirtello tomentoso; stylis denuo partitis ad 0.5 cm. longis; semine 0.35 cm. longo, 0.25 cm. lato, arillodio tenuissime longitudinaliter sulcato, testa antice rugulosa, columella 0.35 cm. longa. Flores ♂: staminibus 8–12; calyce ca. 0.15 cm. magno, pedicello ca. 0.20 cm. longo.

OAXACA: between San Geronimo and La Venta, 200 ft., 1895, *E. W. Nelson 2778* (TYPUS, Gray Herb.).

A low intricately branching shrub, the only known representative of this group in Mexico. It is confused in herbaria with *C. ovalifolius* from the West Indies, which it superficially resembles, but from which it differs widely in floral ♀ characters and in vegetative details. It is also allied with *C. Venturii* from northern Argentina. The specific epithet alludes to the range of this species compared with that of the group.

Croton peraeruginosus, sp. nov.

Frutex ad 2.5 m. altus, ramulis pube argillaceo-tomentosa serius decidua pulchre fulvo-aurantiaca more *C. ferruginei* indutis. Folia supra grisea vel brunnea, subtus tomento griseo ad ochraceo, ad venas aurantiaco tota induta, 11–8 cm. longa, 4–3 cm. lata, lanceolato- vel ovato-elliptica, apice plus minusve acuminata, mucronulata, basi cuneata, margine subintegra laevissime ciliato-denticulata, venis penninerviis 9–14-jugis, patentibus; petiolo 2–5 cm. longo, glandulis subnullis. Cymae ut ramuli indutae, bisexuales, visae vix 5–6 cm. longae. Flores ♀ subsessiles, parvi; calyce vix 0.15 cm. magno, pedicello ca. 0.15 cm. longo, lobis lineari-triangularibus, glandulis hypogynis obviis nullis; ovario minimo, incluso, tomentoso, stylis denuo partitis basi incrassatis, tomentellis, 2–3 mm. longis; capsula demum glabrata vel parcius tomentosa, ovato-truncata, 0.5 cm. magna, semine plumbeo laevissimo, 0.35 cm. longo, 0.25 cm. lato, columella fructu delapso 4 mm. longa.

YUCATAN: *Gaumer 24095,* 1917–21 (TYPUS, Gray Herb.); Xnocac, December 1916, *Gaumer 23484* (Arnold Arb.). CAMPECHE: Dzibalchen, 1932, *Lundell 1385* (Gray Herb.).

Closely resembling *C. ferrugineus* from Colombia and *C. flavens* from Jamaica. It differs from the former in a generally more robust habit and in the larger floral parts. *Croton flavens* has a smaller capsule and

different ♀ flowers. Like *C. Lundellii* and *C. campechianus* which are both very closely allied with species of the West Indies, (*C. cubanus* and *C. lucidus* respectively), *C. peraeruginosus* represents in the flora of Yucatan an essentially Caribbean element. As noted in the introduction to this paper, the affinity to which the new species is related is vast and widespread, ranging from the páramos of Venezuela to the lower valleys of Colombia and Peru, from Yucatan to Porto Rico and Jamaica. It is not excluded that *C. heterochrous* from Honduras, *C. piahuiensis* from northern Brazil and *C. Virletianus* from Mexico may be sectionally allied to this complex.

Croton Roxanae, sp. nov.

Fruticulus bene ramosus, subflexuosus, apicibus ramulorum cortice brunneo discolori, innovationibus atris pilis minutissimis albidis stellatis vix hinc inde adspersis. Folia tetre olivacea vel (igne dessicata) brunneo-discoloria, subtus tenuiter tomentella vel subglabra, 7–4.5 cm. longa, 3.5–1.5 cm. lata, plus minusve elliptica, acuminata, basi plerumque inciso-cordata, margine integra, venis ca. 7-jugis, basi subtriplinerviis caeterum penninerviis; petiolo gracili, 2–1 cm. longo, glandulis subnullis vel nullis. Cymae graciles, 8 cm. longae, bisexuales, longissimo tractu foemineae. Flores ♀ pedicello crasso vix 0.15 cm. longo fulti; calyce cupulato, fere ad basim partito, 0.2 cm. lato, 0.1 mm. longo, lobis triangulari-ovatis, dissitis, integris, petalis (videtur) lineari-ellipticis, lobis subaequilongis glabris; ovario 3-cocco, 0.2 cm. magno, apice hispido, dorso furfuraceo-tomentello, columella fructu delapso gracili 0.5 cm. longa, capitata. Caetera desiderantur.

Maria Madre (Tres Marias Islands) Nayarit: woods just south of the Penal Colony, 1925, *Roxana S. Ferris 5601* (typus, Arnold Arb.).

Belonging in the same complex with *C. Sonorae* from northern Mexico, *C. fragilis sericeus* from central Mexico, *C. fragilis* from Colombia, to which last *C. cienagensis* probably belongs as a synonym. The type-specimen of the new species is unfortunately not complete and a critical reëxamination with better material is much to be desired. The type of *C. fragilis,* preserved in the Berlin herbarium, as well as the isotype in the Museum of Natural History of Paris, are exceedingly poor specimens which it is almost impossible to interpret with certainty. The Liebmann collection used by Mueller Arg. in the publication of *C. fragilis sericeus* is in the Gray Herbarium, together with other specimens collected in Guerrero and Michoacàn (Langlassé 235) and in Sinaloa (Ortega 4212). Schultze 505 from the Berlin herbarium, collected in

Colombia, undoubtedly represents a form which is very near if not identical with the type of *C. fragilis*. The Sinaloa and Guerrero-Michoacàn collections are close to the Maria Madre specimen and to all appearances conspecific with it. The Liebmann specimen and *Purpus 10641* in the Gray Herbarium, collected in Chiapas, differ from the type of *C. Roxanae* and from the Langlassé and Ortega specimens in being velutinous pubescent and in having smaller and definitely sessile flowers. It will have to be seen whether the petal found in one of the ♀ flowers of *C. Roxanae* merely represents an abnormal addition to the calyx. The impression is gained from the material so far available that *C. Roxanae* and *C. Sonorae* are extreme forms of the *C. fragilis* complex, with *C. fragilis subsericeus* representing a fairly distinct form, possibly endemic to eastern Mexico. Better collections with ripe seeds and complete field notes as to habit and habitat are needed before a satisfactory disposition of this complex can be attempted. The arrangement here suggested is tentative and is meant merely as a guide in future work.

Croton Standleyanus, sp. nov.

Frutex videtur, ramulis pube plus minusve tenuiter lepidoto-stellata discolori ochracea vel atro-brunnea indutis. Folia utrinque pallide tabacina vel supra olivaceo-viridia, subtus cinereo-grisea, tomento plus minusve induta vel glabrescentia, 7–5 cm. longa, 2.5–1.5 cm. lata, margine integra, nullibi ciliato-glandulosa, apice acuminata, basi plerumque truncata, interdum laevissime inciso-cordata, venis ca. 12-jugis, tenuibus, penninerviis, ascendentibus; petiolo gracillimo ca. 2 cm. longo, glandulis stipitatis pallidis haud obviis. Cymae haud comosae, bisexuales, ca. 6 cm. longae. Flores ♀ sessiles; calyce fere ad basim partito, cyathiformi-toruloso, intus glandulis hypogynis singulis nullis, 0.5 cm. magno, lobis 8–10 in serie duplici dispositis, ligulato-rotundatis 0.7–0.5 cm. longis 0.2–0.1 cm. latis, externis quam internis minoribus, omnibus margine villis capitato-glandulosis ornatis; ovario ellipsoideo, profunde trigono, tomentello, 0.5 mm. longo, 0.4 mm. lato (submaturo), stylis 3 iterum partitis, cruribus ultimis gracillimis ad 3 mm. longis; semine laevi sub lente puncticulato, 0.3 cm. longo, 0.25 cm. lato, caruncula triangulari-hastata, columella 0.5 cm. longa. Flores ♂ : staminibus 10–12, calyce ca. 0.3 cm. magno, lobis triangularibus puberulis, petalis glabris subaequilongis, pedicello 0.2–0.3 cm. longo. Nomen specificum cl. P. Standley honorat.

VERA CRUZ: Cuitlahuac, 1937, *Matuda 1461* (TYPUS, Arnold Arb.); Zacuapan, 1917, *Purpus 7752* (Arnold Arb.).

Distributed as *C. rhamnifolius* which it does not resemble. It is

closely allied to *C. decalobus* from Costa Rica, and like it, belongs to sect. DECALOBIUM. From *C. decalobus*, which is probably identic with *C. Pittieri*, *C. Standleyanus* differs in the leaves rounded or truncate, not long-cuneate at base and in a sum of floral details. Standley suggests (Publ. Field Mus. Bot. 18: 606. 1937) that *C. Turrialva* may be the same as *C. Pittieri*.

Croton tremulifolius, sp. nov.

Frutex habitu pulvinato rotundato, 2–3 ped. altus, cortice in apicibus vinoso-brunneo, pilis luteis subsimplicibus patentibus hirtulo, serius papillato. Folia tabacina vel pallide brunnea, ex gemma deprompta tomento velutinoso cinereo vel ochraceo induta, adultiora subglabra, 9–7 cm. longa, 7–5 cm. lata, late ovata rotundata, basi cordata lobis arcte contiguis vel sese invicem obtegentibus, margine adulta repandula, juniora subserrulata, venis late patentibus obscure anastomosatis, 4–5-jugis; petiolo 1–4 cm. longo, glandulis minutissimis vel subnullis. Cymae interdum inter folia summa verticillata suboccultatae, bisexuales, ad 5 cm. longae. Flores ♀ breviter stipitati, stipite 0.2 cm. longo, crassiusculo; calyce ca. 0.5 cm. lato (deflorato), lobis lineari-lanceolatis plerumque 6 (rarius 5–7), posticis (an semper?) minoribus; ovario hispido, globoso, stylis 3 fere ad basim partitis, intricatim ramosis; semine laevi nitidissimo subochraceo, 0.45 cm. longo, 0.25 mm. lato; caruncula apicali minuta, columella robusta ad 0.5 cm. longa. Flores ♂ breviter pedicellati; staminibus ca. 20; calyce ca. 0.2 cm. magno.

COLIMA: vicinity of Manzanillo, between Cuyutlan Lagoon and the ocean, 1925, *Roxana S. Ferris 6176* (TYPUS, Arnold Arb.); Manzanillo, 1890 *E. Palmer 968* (Gray Herb.).

Near *C. Magdalenae* and *C. morifolius* but easily distinguished from the former by the much less thick indument; from the latter by the hispid pubescence of the branchlets and from both by the peculiar brown-vinose color of the papillate older wood. The prevailing number of the lobes of the ♀ calyx, 6 instead of 5 as usual for the species of the genus, is an interesting character, the full significance of which is at present difficult to appraise.

Croton Ynesae, sp. nov.

Frutex vel arbuscula 4–6-metralis, ramulorum apicibus subherbaceis glabris. Folia atro-viridia, membranacea, lepidibus minutis albicantibus valde sparsis omissis utrinque glabra, 14–9 cm. longa, 8–4 cm. lata, ovato-cuspidata vel elliptico-acuminata, basi rotundata, margine grosse irregulariter dentato-serrata; venis arcuatis 3–4-jugis anastomosatis;

petiolo 7–3.5 cm. longo, glandulis ad 10 aggregatis. Cymae glaberrimae, graciles, atrae, bisexuales ad 8 cm. longae. Flores ♀ sessiles vel subsessiles; calyce minuto, annulato-cupuliformi 0.15 cm. lato, lobis latissime dissitis vix 0.05 cm. longis; ovario minimo, vix 0.1 cm. magno, globoso, nempe in toro glanduloso imposito, pulchre aureo-lepidoto, stylis 3 profunde bipartitis, habitu erectis, ad 0.3 cm. longis; capsula lepidibus minutissimis tantum sparsis pro glabra laudanda, laevi, atra, columella ad 0.5 cm. longa, apice optime tripartita; semine plumbeo, laevissimo, 0.5 cm. longo, 0.35 cm. lato, caruncula subapicali lata. Caetera desiderantur.

JALISCO: Santa Cruz de Vallarta, alt. 300 m. 1926, *Ynes Mexia 1279* (TYPUS, Arnold Arb.). TEPIC: San Blas, Nayarit, on road to Tepic, 1925, *Roxana Ferris 5518* (Arnold Arb.).

Distributed as *C. macrodontus,* which has much smaller leaves and quite different flowers. The peculiar ♀ flower calyx, the lepidote, not hispid nor lanose ovary, the lack of any persistent indument easily distinguish the new species from *C. stylosus,* a Mexican species which it somewhat resembles but has setose-ciliate petioles and leaf-margins.

CENTRAL AMERICAN SPECIES

Croton callistanthus, sp. nov.

Stirps pulchra, arbor ad 45 ped. alta, cymarum longitudine (ad 70 cm.) insignis, apicibus tomento furfuraceo ochraceo detergibili indutis. Folia inter generis maxima, plerumque viridia, adulta glabrescentia, juniora tomento pannoso griseo vel ochraceo detergibili induta, ad 30 cm. longa, 18 cm. lata, vulgo 17–15 cm. longa, 8–10 cm. lata, elliptica, cuspidato-acuminata, basi cordata, margine subintegra, venis ca. 10-jugis, primo jugo subtriplinervio longe ramifero, caeteris late patentibus penninerviis; petiolo herbaceo, fistuloso, glabrescente, vulgo 8–12 cm. longo, ad 19 cm. longo, glandulis sub apicem utrinque 2–3. Cymae longissimae caudatae, basi validissimae (ad 0.6 cm. crassae), basi ♀, dein bisexualibus, floribus glomerulatis. Flores ♀ pedicello 0.5–0.6 cm. longo graciliore fulti; calyce 0.5 cm. lato, 0.3 cm. longo, subrotato, lepidoto-tomentoso, lobis late ovatis triangularibus, ca. 0.2 cm. magnis, laevissime imbricativis; ovario globuloso, ca. 0.3 cm. magno, subincluso, pube laetissime aurantiaca insigni, stylis bis bifidis nigris, gracilibus, 0.3–0.4 cm. non superantibus. Flores ♂ gracillime pedicellati, pedicello ad 0.4 cm. longo, plerumque lutescente; staminibus ad 20; calyce ca. 0.35 cm. magno, lobis petalis subaequilongis.

GUATEMALA: Dept. Quezaltenango, Colomba, 2800 ft. 1934, *Skutch*

2025 (TYPUS, Arnold Arb.); Dept. Quiché, 6000 ft. 1934, *Skutch 1723* (Arnold Arb.).

A very remarkable species distantly resembling *C. panamensis* and *C. Steyermarkianus,* but easily distinguished from both by the vivid-colored ovary and the very large leaves. In vegetative characters this is the largest known species of this group. *Croton Jimenezii,* to judge from the type, *Standley 33204,* which only carries ♂ flowers, is a species in this vicinity but has scurfy-brown pubescence, smaller and differently shaped leaves and larger flowers.

Croton pagi-veteris, sp. nov.

Frutex videtur, apicibus totis ochraceis tomentellis, citius glabratis, cortice adultiore vinoso-brunneo. Folia supra brunnea, pilis fasciculatis subpaucis glabrata, subtus tomento laeviusculo grisea, 10–6 cm. longa, 5–3 cm. lata, ovata, basi late rotundata vel subcuneata, margine distanter atque obiter serrulata, venis tomento magis ochraceo notatis, ca. 5-jugis, primo jugo subtriplinervio, caeteris penninerviis; petiolo 2–3 cm. longo, supra canaliculato, supra in apice glandulis 2 tubulosis ornato. Cymae bisexuales ad 9 cm. longae, floribus utriusque sexus in glomerulis paucifloris segregatis. Flores ♀: calyce turbinato (i.e. in pedicellum crassiusculum ad 0.1 cm. longum abeunte), ca. 0.15 cm. magno, lobis erectis, triangularibus, integris, haud imbricatis; ovario subincluso, pallide ochraceo-tomentello, stylis nigris pro ratione floris minimi crassiusculis, ad 0.25 cm. longis. Flores ♂ immaturi: alabastro tomentello ca. 0.1 cm. magno, breviter pedicellato.

GUATEMALA: Dept. Huehuetenango, Pueblo Viejo, limestone hills, 1896, *Seler 2776* (TYPUS, Gray Herbarium).

Donnell Smith determined this plant as *C. xalapensis* which is altogether different, both in floral and in vegetative characters. The general affinities of *C. pagi-veteris* are with the group of *C. mexicanus-C. corylifolius,* of which it represents a distinct, not lepidote form. *Croton Oerstedianus,* which to judge from a photograph of the type has a ♀ calyx similar to that of the new species, is lepidote and seems to be very near *C. Tonduzii* from Costa Rica.

Croton pseudoxalapensis, sp. nov.

Arbor vel frutex ad 3 m. altus, apicibus ochraceis tomento stellato detergibili scabrido plus minusve indutis. Folia supra glabrescentia, ochraceo-brunnea vel subolivacea, subtus pube sat firma cinerascentia, 12 cm. longa, 5.5 cm. lata, ovata, cuspidata vel caudata, basi leviter rotundato-cordata, margine serrulata, serraturis 3–4 per cm., venis plus minusve regulariter penninerviis, 10–12-jugis, arcuato-adscendentibus,

obscure anastomosatis; petiolo herbaceo, 2–2.5 cm. longo, subtus in apice glandulis 2 late patellatis ornato. Cyma stricta, 25 cm. longa, bisexualis. Flores ♀ brevissime pedicellati, pedicello ca. 0.1 cm. longo; calyce 0.4 cm. lato, 0.35 cm. longo, ad basim fere partito, lobis 5 [interdum lobulo addito ad 6], triangulari-acutis, subsetaceis, glandulis perigynis 1–2 bacillari-glandulosis, minutis; ovario ca. 0.3 cm. magno subtrigono, pallide luteo-tomentoso, stylis 3 fere ad basim partitis, ad 0.65 cm. longis. Flores ♂ immaturi, pedicello ad 0.1 cm. longo, alabastro subglobuloso, ca. 0.1 cm. magno.

HONDURAS: Dept. of Comaguaya, vicinity of Siguatepec, alt. 1080 to 1400 m. 1928, *Standley 55987* (TYPUS, Arnold Arb.).

Croton pseudoxalapensis var. **cobanensis,** var. nov.

Foliis majoribus ad 25 cm. longis, 14 cm. latis, petiolo ad 11 cm. longo glandulis disciformibus 6–8 sub apicem petioli nempe patellis circumcirca aggregatis a typo distinguitur.

GUATEMALA: Coban 1350 m., 1906, *von Turckheim ii–1015* (TYPUS, Gray Herb.). The type was distributed as *C. flavens* and the variety as *C. panamensis,* both of which are very different species. The nearest affinity of the new species and its variety is with *C. xalapensis,* a well known Mexican endemic. *Croton pseudoxalapensis* is distinguished from *C. xalapensis* by the less pannose indument, by the shorter and less setaceous lobes of the ♀ calyx [0.2 instead of 0.3 cm. long], by the styles [0.3 instead of 0.6 cm. long], and by a sum of intangibles that make it intermediate in vegetative and floral characters between *C. xalapensis* and forms of the aggregate centering around *C. pungens* from Venezuela. The variety differs from the type-form in the peculiar numerous glands, and so far as the type shows, in the much larger leaves. No difference in seed separates *C. pseudoxalapensis* and its variety from *C. xalapensis.*

Croton Steyermarkianus, sp. nov.

Arbor ad 9 m. alta, apicibus pube argillaceo-stellata ochracea cito decidua indutis. Folia discolori-olivacea, supra glabrescentia, subtus pube facillime detergibili subgrisea, 15–10 cm. longa, 12–8 cm. lata, late obovata, apice abrupte in cuspidem ad 1 cm. longam coarctata, basi late cordata, margine integra, venis ca. 7–9-jugis, primo jugo bene ramigero, arcuato-adscendentibus penninerviis; petiolo 6–12 cm. longo, sub apicem utrinque at supra praesertim glandulis parvis 8–9, margine cerinis, centro pustulosis ornato. Cymae validae ad 25 cm. longae, fere totae glomerulis bisexualibus obsitae. Flores ♀ inter plures ♂ plus

minusve centrales, pedicello ad 0.7 cm. longo fulti; calyce 0.45 cm. lato, 0.3 cm. longo, fere ad basim partito, lobis 5 late ovatis, sublepidotis, laevissime imbricativis, 0.25 cm. longis, ca. 0.2 cm. latis; ovario globuloso subdepresso, ca. 0.25 cm. magno, subincluso, pallide luteo-aurantiaco, stylis 3 ad basim partitis, ad 0.3 cm. longis. Flores ♂ pedicello gracili ad 0.4 cm. longo fulti, staminibus 15–20, calyce ca. 0.4 cm. lato, 0.25 cm. longo, petalis lobis subaequilongis. Nomen specificum pro J. E. Steyermark sumitur.

Costa Rica: Prov. S. José, vicinity of El General, in clearings, 880 m. 1936, *Skutch 2603* (typus, Arnold Arb.).

Distributed as *C. Draco hibisciformis,* but certainly differing from the typical form of that species in the thinner indument, in the longer pedicel of the ♀ flower and in the much more broadly ovate leaves which are abruptly cuspidate not gradually acuminate. *Croton panamensis* has different vegetative characters, resembling *C. draconoides* from Brazil, and to a lesser extent, *C. Lechleri* from Peru. The capsule of *C. panamensis* is tomentose as well as hispid, while that of *C. Steyermarkianus* is only tomentose. Mueller Argoviensis altogether misunderstood the specific limits of *C. Draco, C. panamensis* and *C. gossypiifolius.* Of these three species, the first occurs only in Mexico, though certain incomplete collections of northern Central America may represent a very near species. The second is certainly known only from Panama. *Croton gossypiifolius* is essentially a Venezuelan and Trinidad endemic, which is represented in Colombia by a nearly related species, *C. Funckianus.* The Mexican plant which Mueller Argoviensis has identified as *C. gossypiifolius stipularis* (in DC. Prodr. 15^2: 539. 1866) is a form of *C. Draco;* a form of this same species is the Liebmann specimen from the vicinity of Vera Cruz cited by the same author (op. cit. 547) under *C. panamensis.* The complex centering around *C. Draco* and *C. gossypiifolius* is one of the most important for the regions of Central America, northern South America and southern Mexico. It consists of a multitude of related species and forms which so far have been confused under two or three binomials.

Croton triumfettoides, sp. nov.

Arbor videtur, apicibus pube citius decidua sericeo-hispida simulque conferte stellata hinc inde tomentosis. Folia supra atro-brunnea glabrescentia, subtus tomento detergibili flocculoso griseo pubescentia, 17 cm. longa, 10 cm. lata, ovato vel ovato-elliptica, cuspidata vel acuminata, basi cordata plus minusve rotundata, margine subintegra oculo armato tenuissime serrulata, venis utrinque 7–9-jugis, subobscuris, adscendentibus; petiolo herbaceo 13 cm. longo, sub apice utrinque

glandulis stipitatis atris crebris confecto. Cymae ad 30 cm. longae, bisexuales, totae hispidae, floribus glomerulatis. Flores ♀ pedicello ca. 0.5 cm. longo fulti; calyce 0.4 cm. lato, 0.3 cm. longo, lobis hispidis ligulato-ovatis, apice plus minusve acuminatis, 0.2 cm. magnis; ovario subincluso, ca. 3 mm. magno, pube atrobadia toto hispidulo, stylis subcarnosulis, ad basim partitis, nigris, glabris, ad 0.3 cm. longis. Flores ♂ pedicello ca. 0.4 cm. fulti; staminibus ca. 15; calyce 0.3 cm. lato, 0.25 cm. longo, petalis lobis subaequilongis.

COSTA RICA: Pastures (?), 1919, *Lankestes K26* (TYPUS, Arnold Arb.).

In vegetative characters near *C. panamensis* which has an altogether different indument; near *C. Purdiei* from Colombia in indument but differing in every other character. The crowded long cyme with the very hispid buds reminiscent of certain specimens of *Triumfetta* carrying immature fruits, is unlike any found in other species of this group so far as is known to me.

COLOMBIAN, VENEZUELAN AND ECUADOREAN SPECIES

Croton aequatoris, sp. nov.

Frutex vel arbuscula ad 4 m. alta, pube stramineo colore in apicibus hispidulo-tomentosa. Folia tenuiter membranacea, iis *C. gracilipedis* forma subsimilia, ovato-cuspidata, utrinque brunnea subtus pallide discoloria, pilis fasciculatis vel patule stellatis, habitu hispido-setulosis, utrinque at subtus praesertim induta, 9–5 cm. longa, 6–3 cm. lata, margine subintegro vel laeviter repando-dentato, venis penninerviis 4–6-jugis, late arcuatis, eleganter a margine 0.3–0.5 cm. remotis anastomosatis; petiolo hispidulo 4–2.5 cm. longo, glandulis suprapetiolaribus stipitatis 2–4. Cymae gracillimae, 10–18 cm. longae, bisexuales, tenuiter hispidae, floribus utriusque sexus glomerulatis. Flores ♀ minuti, sessiles; calyce ad 0.15 cm. magno; calycis lobis lineari-lanceolatis, ovario globuloso hispido dimidio brevioribus, ad 0.05 cm. longis, stylis 3 ad tertium infimum bipartitis ca. 0.3 cm. longis, glandulis hypogynis obviis nullis, semine profunde cerebrato-rugoso 0.5 cm. longo, 0.375 cm. lato, caruncula late patellariformi apicali, coccis (delapsis) pube evanida fere glabris, ad 0.5 cm. longis. Flores ♂: pedicello 0.1 cm. longo, staminibus ad 12, calyce ca. 0.2 cm. magno.

ECUADOR: El Recreo, in fruticetis, 1896, *Eggers 15498* (TYPUS in herb. Berol.).

Nearest in a sum of characters to *C. saltensis* which is strictly localized in northern Argentina and in the adjacent Bolivian region, at the foot

of the Andes. *Croton peruvianus* to judge from a fragment of the typic collection may be near the present species, but its midrib is covered by a very characteristic straw-colored, branching tomentum and its veins are ascending penninerved not broadly and gracefully arching.

Croton ater, sp. nov.

Arbor ad 70–80 ped. alta, 1–2 ped. trunci crassitie, apicibus pube argillacea subaurantiaca scabra indutis. Folia utrinque atro-viridia, pube argillaceo-lepidota rufida parcius induta, inde subglabra, 14–8 cm. longa, 7–3.5 cm. lata ovata, longe acuminata vel subelliptica acuta, basi plerumque truncata vel rotundato-truncata, venis irregulariter 7-jugis, adscendentibus, apice longe furcantibus, margine subremote obscureque crenato, glandulis ceraceis late patelliformibus more proprio obsito; petiolo 4 cm. longo, apice glandulis 2 sessilibus carnosulis utrinque ornato. Cymae validae ad 30 cm. longae, angulosae, basi 0.4 cm. diametientes, totae capitulis confertis florum utriusque sexus obsitae. Flores ♀ : pedicello 0.7 cm. longo, rigide exserto; calyce ca. 0.25 cm. magno, ad imam basim partito, laciniis integris, optime dissitis, 0.125 cm. longis, 0.05 cm. latis, ovario globuloso ca. 0.3 cm. magno, pulchre luteo-tomentoso, stylis nigris convolutis 0.3–0.4 cm. longis. Flores ♂ : staminibus ca. 8–12, calyce ca. 0.2 cm. magno, lobis petala subaequantibus, pedicello capillaceo 0.7–0.5 cm. longo.

Colombia: Dept. of Boyaca, region of Mt. Chapon, El Umbo, thick forest edge, alt. 3000 ft. 1932, *Lawrance 593* (typus, Gray Herb.).

Nearest to *C. panamensis* from Panama and to *C. draconoides* from Brazil which it links within a single taxonomic and phytogeographic close unit. It might also be allied with *C. Sampatik* from Peru, but the type-specimen of this last has only ♂ flowers and can not be satisfactorily compared with the type of the present species. The dull green color of the leaves, the numerous comparatively small, clustered flowers, the color of the ovary and the buttonlike glands of the margin of the leaf are useful characters of sight-determination.

Croton bolivarensis, sp. nov.

Fruticulus videtur, citius glabrescens, cortice laevi vinoso-brunneo, apicibus tomento lepidoto-stellato canescentibus, pilis hinc inde hispidis nigricantibus insignibus. Folia tomentosula supra cinereo-viridia, subtus cinereo-canescentia, nervis tomento crassiore perspicuis, 7–4 cm. longa, 4–1 cm. lata, elliptica, apice late acuminata, basi inciso-cordata, margine sub lente minute serrulatis, venis 6–9-jugis, arcte adscendentibus; petiolo gracillimo eglanduloso 4–1 cm. longo, ad basim stipulis

auriculatis (saltem in innovationibus) praedito. Cymae haud comosae, bisexuales, ad 4 cm. longae, floribus subsolitariis bracteola integra lineari, ca. 0.3 cm. longa fultis. Flores ♀ pedicello 0.05 cm. longis fulti; calyce extus basi hispido, apice puberulo, intus tomentello, albicante, in anthesi ca. 0.4, fructu submaturo ca. 0.7 cm. magno, lobis ca. 0.2 cm. longis, reduplicato-imbricativis, integris, ovarium hispidulum, pallide luteum includentibus, secus dorsum pilis nigrescentibus lineato vel notato; stylis iterum partitis, gracilibus. Flores ♂ immaturi, calyce ut illo ♀ notato, alabastro ad 0.2 cm. magno, pedicello ca. 0.2 cm. longo.

VENEZUELA: Santa Catalina, Lower Orinoco, 1896, *Rusby & Squires 278* (TYPUS, Gray Herb.); Ciudad Bolivar, about 35 m. 1931, *Holt & Blake 861* (U. S. Nat. Mus.).

Very near *C. Bredemeyeri* (*Pittier 14008,* U. S. Nat. Mus.) and perhaps ultimately to be considered only a geographic variety of it. In *C. Bredemeyeri* the ♀ calyx is slightly denticulate, while it is entire in *C. bolivarensis*. The difference, however, may be due to age, old ♀ flowers and fruits tend to have denticulate calyces, young ones entire, as this is the case with *C. macrodontus*. Minor intangibles of leaf texture, however, suggest that *C. Bredemeyeri* and *C. bolivarensis* may be distinct, the last representing an intermediate form between *C. jacobinensis* of northern Brazil and *C. Bredemeyeri* endemic in northern Venezuela (Aragua and near Caracas).

Croton Killipianus, sp. nov.

Arbor, ad 20–25 ped. alta, apicibus subgracilioribus, ad 0.35 cm. crassis, pube ochracea argillacea dissite indutis. Folia concoloria olivaceo-viridia, utrinque sed supra praesertim lepidibus argillaceis sparsis ruvidula, 17–13 cm. longa, 11–7.5 cm. lata, subobscure triloba vel sublobulata, basi latissime rotundata ad cuneata, margine laevissime serrulata, apice late acuminata (novella elliptica, acuminata, ca. 5 cm. longa, 1.5 cm. lata), lamina utraque facie hinc inde glandulis cerinis patelliformibus sessilibus ad 0.1 cm. latis more peculiari nempe incrustata, venis 6–9-jugis adscendentibus, primo jugo subtriplinervio, caeteris penninerviis; petiolo 7–3.5 cm. longo, sub apice utrinque glandulis 2–4 patelliformibus cerinis donato. Cymae bisexuales graciliores, paniculatim effusae, floribus utriusque sexus in glomerulis paucifloris aggregatis, ad 25 cm. longae. Flores ♀ in anthesi pedicello ad 0.8 cm. longo fulti; calyce argillaceo-tomentoso, 0.7 cm. lato, 0.5 cm. longo, leviter saltem imbricato, lobis ovato-acuminatis, integerrimis, dorso costato-carinatis, 0.35 cm. longis, 0.35 cm. latis, intus tomentoso-hispidulis; ovario incluso, pallide luteo-tomentoso, ca. 0.3 cm. magno,

stylis flabellatim partitis, laciniis ad 15, 0.3 cm. longis. Flores ♂ haud evoluti, pedicello ad 0.3 cm. longo, alabastro ca. 0.2 cm. magno. Nomen specificum pro cl. E. P. Killip inscribitur.

COLOMBIA: State of Boyaca; region of Mt. Chapon, extreme western part of Dept. of Boyaca, northwest of Bogota, forest edge at stream side, Umbo region, alt. 3700 ft., 1932, *Lawrance 588* (TYPUS, Arnold Arb.).

Like *C. Smithianus* distributed under the erroneous determination *C. palanostigma,* which has different leaves and indument and is endemic in the Amazonas regions, scarcely if at all reaching the foot of the Peruvian Andes. The new species is nearest to *C. Smithianus* but immediately separated from it by the argillaceous thin indument.

Croton Killipianus, C. Smithianus, C. Benthamianus, C. cearensis and *C. palanostigma* form a homogeneous and distinct group, with range extending from Ceará in northern Brazil, to Colombia and to Matto Grosso. The three classic species of this group, *C. cearensis, C. Benthamianus* and *C. palanostigma* are not easily separated and may be better understood, pending definite revision, as geographic forms of the same entity.

Croton meridensis, sp. nov.

Croton ferrugineus Pittier in Jour. Wash. Acad. Sci. **2**: 10. 1930; non H.B.K.

Fruticulus videtur, dichotome ramosus, apicibus pube ochracea vel pallide aurantiaca tomentellis. Folia supra brunnea glabrescentia, subtus tomento vix conferto discoloria cinerea, venis plus minusve sordide luteis, 3–2 cm. longa, 2–1 cm. lata, elliptica, apice rotundata vel latissime acuminata, mucronata, basi plus minusve rotundato-cuneata, margine subintegra, levissime ciliato-serrulata, venis penninerviis utrinque ca. 5-jugis, adscendentibus. Cymae bisexuales ad 6 cm. longae. Flores ♀ in axilla stipulae minimae triangularis sessiles, 0.2 cm. magnis, lobis erectis, lineari-triangularibus, discretis, sub fructu vix 0.175 cm. longis, 0.05 cm. latis, ovario subincluso ochraceo tomentello, stylis 3, fere ad basim partitis, semine griseo, arillodio granuloso-punctato, testa sub arillodio rugis tenuibus 2–3 exarata, 0.4 cm. longo, 0.2 cm. lato, caruncula apicali. Flores ♂: pedicello ca. 0.2 cm. longo; staminibus ca. 15, calyce 0.3 cm. lato, 0.2 cm. longo, petalis quam lobis ⅓ longioribus, glabris.

VENEZUELA: Merida, Páramo del Morro, 2500 m. 1922, *A. Jahn 1063* (TYPUS, U. S. Nat. Mus.).

Differs from the holotype of *C. ferrugineus* in the much shorter petioles,

in the fewer primary veins (10–12 pairs in *C. ferrugineus* in a leaf 2 cm. long; 5–6 pairs in a leaf of the same length in *C. meridensis*), in the coarser and not velutinous indument, in the smaller and slenderer styles and in intangibles of habit and flowers. *Croton ferrugineus,* which I judge to be well represented by *Killip 5420,* collected in Colombia, Dept. El Valle, Dagua, is a species apparently endemic to lower altitudes (about 1000 m.) while *C. meridensis* occurs in the high "páramos" at 2500 m. It is worthy of notice that forms of *C. flavens* are found in Porto Rico and Jamaica which closely resemble *C. meridensis. Croton meridensis* should not be confused with *C. malacophyllus* (*Pennell 2704,* U. S. Nat. Mus.; *André 1408,* N. Y. Bot. Gard.; *Schultze 183,* Berlin Bot. Gard.) which is mistakenly reduced by Mueller Arg. to a variety of *C. dolichostachyus* (in DC. Prodr. **15**^{2}: 610. 1866). *Croton malacophyllus* is intermediate between this species and *C. ferrugineus,* but is much more hairy than either.

Croton Rimbachii, sp. nov.

Arbor mediocris, apicibus pube stellata sordide ochraceo-cinerea indutis. Folia supra levissime rugosa, griseo-discoloria, nervo medio excepto glaberrima, tactu vix scabridula, subtus plus minusve sordide tomentosa, 13–8 cm. longa, 6–4 cm. lata, ovato-elliptica vel subtriangulari-ovata, cuspidata, basi rotundata vel latissime triangulari, margine integro subrevoluto visa nequaquam cordata, venis ca. 8-jugis arcuato-adscendentibus; petiolo 6–3.5 cm. longo, glandulis 2 gracillimis ornato, more C. celtidifolii setaceo-capitatis at lentis, ad 0.5 cm. longis. Cymae pro more specierum huius affinitatis breviores, ipsae longissimae visae 15 cm. metientes, vulgo tantum 6–8 cm., novellae ochraceo-hispidae. Flores ♀ optime pedicellati, pedicello hispido 0.8 cm. longo; calyce 0.6 cm. lato, ca. 0.5 cm. longo, ad basim partito, lobis 5 ovatis, extus hispido-tomentosis, intus primo intuito brunneo-nitidis, pilis raris hinc inde praeditis; ovario tomentoso sordide ochraceo, globuloso, ca. 0.3 cm. magno, stylis 3 gracilibus, effusis, fere ad basim partitis, 0.5 cm. longis. Flores ♂ pedicello gracillimo ad 0.8 cm. longo fulti, calyce ca. 0.5 cm. magno, petalis glabris lobos subaequantibus, staminibus numerosis, ad 45.

ECUADOR: Eastern Cordillera 2000 m., on eastern slope of Mt. Tungurahua, 1933, *A. Rimbach 94* (TYPUS, Arnold Arb.); same date and locality, *A. Rimbach 239* (U. S. Nat. Mus.).

Easily mistaken for *C. magdalensis,* from the vicinity of Bogotà and the valley of the Magdalena in Colombia, from which it differs, however, in numerous characters: the leaves are not cordate, the petioles are shorter, the indument is coarser and not ashen-whitish; the lobes of the

♀ calyx are larger, the ♂ flower is bigger and has more numerous stamens. *Croton sordidus* has larger ♀ flowers with shorter pedicels, more scabrid leaves and a more floccose, less hispid indument on the young parts. *Croton polycarpus* is a coarser species with the young leaves and stems heavily clothed with yellow floccose tomentum. *Croton Mutisianus,* which I believe to be represented by Pennell, Killip and Hazen 8716 [under *C. magdalensis glabratus* in Gray Herb.], collected in the Dept. of Caldas, Colombia, is strongly glabrescent to glabrous with about 6–9 pairs of broad spreading primary veins, which are black in all the specimens I have seen so far and strongly contrast with the olivaceous background of the underside of the leaf.

Croton Smithianus, sp. nov.

Frutex paucirameus, 6–12 ped. altus, apicibus pube grossa sub lente straminea in apice pilos stellatos gerente incrassatis. Folia supra brunnea, subtus olivaceo-viridia, utrinque lepidibus argillaceis sparsis ruvida, hinc inde subtus glandulis patelliformibus sparsis obsita, 17–11 cm. longa, 11–7 cm. lata, more Fici Caricae triloba, lobulata vel ovata subintegra, basi truncata vel levissime cordato-truncata, apice latissime acuminata saepe submucronulata, margine obscure repandula, petiolo tomento incrassato 10–4 cm. longo, glandulis sub apice 2–4 patelliformibus. Cymae [fractae visae], validae, ad 20 cm. longae. Flores ♀ longe deflorati pedunculo ad 2.5 cm. longo fulti; calyce fere ad basim partito, accrescente, lobis 0.7 cm. longis, 0.5 cm. latis, late ovatis, extus ruvidis, hispidis, intus glabris, ad basim glandula maculosa praeditis setarum pennicillis (loco petalorum) cum lobis alternis; semine pallide brunneo undique longitudinaliter striato, corrugato-granuloso, 0.5 cm. longo, 0.3 cm. lato, caruncula dolabriformi valde adpressa, coccis (solutis) 0.9 cm. longis, columella 0.5–0.6 cm. longa. Nomen specificum cl. A. C. Smith honorat.

Colombia: Dept. Santander, Mesa de los Santos, alt. 1500 m., on edge of woods, Dec. 1926, *Killip & Smith 15283* (typus, Arnold Arb.).

Distributed as a form of *C. palanostigma,* but unlike that species. The very scabrid, often trilobed leaves and the peculiar, coarse indument easily distinguish it from *C. gossypiifolius* and *C. Killipianus.* Under the lens the lower face of the blade reveals scattered button-like glands.

Croton subsuavis, sp. nov.

Frutex gracilis, ramis fasciculatis, pube pallida ochracea hispida decidua plus minusve indutis, cortice adultiore vinoso-brunneo laevi. Folia ad apicem ramulorum plerumque aggregata, supra brunnea, parcius

tomentella, tactu velutina, subtus tomenti grisei copia incrassata, nervis totis pilis hispidulis ochraceis insignita, 6–2.5 cm. longa, 2–1 cm. lata, lanceolato-elliptica, patenter crenulato-serrata, basi cuneata interdum inaequali; petiolo ca. 1–0.5 cm. longo, glandulis 2 stipitatis. Cymae bisexuales, 3–5 cm. longae. Flores ♀ brevissime pedicellati, pedicello plus minusve 0.15 cm. longo; calyce urceolato, ca. 0.2 cm. magno, lobis lineari-triangularibus, ovario globoso subincluso pilis ochraceis hispidulo, stylis ad basim bipartitis. Flores ♂ nondum evoluti, in cymis immaturis arcte spicato-congestis.

COLOMBIA: locality unknown, *Mutis 4438* (TYPUS, U. S. Nat. Mus.); Dept. Cundimarca, Melgar, 900–1300 m., open slope shrub, *Pennell 2858* (U. S. Nat. Mus.).

I have not seen the type of *C. suavis* which according to the publication (H. B. K. Nov. Gen. Sp. **2**: 60. 1817) was collected in eastern Venezuela (Cumana) and is not described as hispid tomentose. I have seen, however, *Schomburgk 944* which Mueller Arg. cites (in DC. Prodr. **15**^{2}: 625. 1866) with the type. The Schomburgk collection differs from *C. subsuavis* in the much more appressed and scantier indument; in the leaves with an almost entire margin, suggesting a broad crenation but not a sharp serration; in the larger and less tomentose calyx of the ♀ flower. On the same sheet with *Schomburgk 944* (in herb. Berol.) is mounted *C. salviifolium* Link mss. collected at an unspecified South American locality, which in my opinion is *C. subincanus*. The material seen indicates that *C. subsuavis* represents in Colombia the complex to which belong *C. suavis* (Eastern Venezuela and British Guiana), *C. subincanus* (Guiana) and *C. Gardnerianus* (Ceará, Brazil). This last should not be confused with *C. Gardneri* which is a Brazilian species of the Astraea affinity.

Croton xanthochloros, nom. nov.

Croton multicostatus, Pittier in Jour. Wash. Acad. Sci. **20**: 7. 1930. Non Muell. Arg.

Croton multicostatus Pitt. is invalidated by the earlier publication of *C. multicostatus* Muell. Arg. (in Linnaea, **34**: 79. 1865). In the Gray Herbarium is preserved a photograph of the type of *C. flavovirens*, typified by a specimen of Bredemeyer in herb. Willd. On this photograph clearly shows a manuscript note of Mueller Arg. to the effect that the binomial is published in the Prodromus. It is manifest that Mueller overlooked the binomial after writing the note on the specimen because no trace of it can be found, either in the Prodromus or elsewhere. Kunth ignores *C. flavovirens* altogether (Init. Flor. Venez. 430. 1927 [Fedde

Rept. Beih. lxiii]). I would use the binomial of Mueller were I certain that it represents the same species that Pittier called *C. multicostatus*. Although it is very nearly sure that this is the case, nothing but a direct inspection of the specimen can settle the issue whether *C. flavovirens* is not *C. Pullei* Lanj. which has a large many-veined leaf, or some other species or form of this affinity. The Willdenowian specimen being at present unavailable, I have chosen a new name for the species of Pittier. It is probable that *Pittier 11948* which Pittier himself has provisionally identified as *C. xanthochloros* (*C. multicostatus*, Pitt.) (loc. cit., 8) is in reality *C. megalodendron*, published by Mueller Arg. (Flora, **40**: 4. 1872) on a specimen of Bredemeyer collected "propre Caracas." I am very much indebted to Mr. Pittier for the loan of *Pittier 11948* which was collected at Caruao, near Caracas. The characters of this specimen do not suggest that it is certainly conspecific with *C. xanthochloros*, confirming the wisdom of Pittier's provisional determination. A critical comparison of *all* the types of the species of this affinity is necessary and better collections are desirable before a final disposition of the binomials involved can be attempted.

PERUVIAN AND BOLIVIAN SPECIES

Croton Astianus, sp. nov.

Stirps pro genere adhuc inusitata; frutex ad 4 m. altus, apicibus tomento sordide luteo indutis cortice hinc inde fisso-suberoso. Folia supra facie tenuiter coriacea, rugulosa, griseo-brunnea, subtus tomenti sordide lutei copia villosula; 16–6 cm. longa, 5–3 cm. lata, elliptica vel elliptico-lanceolata, basi cuneato-rotundata, margine more proprio papillis setigeris crebris zonata, venis supra impressis ca. 8-jugis, primo jugo subtriplinervio, caeteris penninerviis, petiolo ad 3.5 cm. longo, basi stipulis subsetaceis 1–1.5 cm. longis integris insignito, glandulis obviis nullis. Cymae caudatiformes, ad 30 cm. longae, tractu majore ♂. Flores ♀ solitarii, calyce 0.9 cm. longo, 0.6 cm. lato, griseo-tomentoso, ad medium partito, lobis longis, triangulari-lanceolatis, acutis 0.6 cm. longis, 0.2 cm. latis, intus glaberrimis atro-brunneis, ovario hispido, pro ratione floris minuto, vix 0.175 cm. magno, globuloso, stylis 3 ad basim bis bifidis, carnosis, nigris, canaliculatis, ad 0.5 cm. longis. Flores ♂ immaturi, alabastro globoso ca. 0.3 cm. magno, pedicello 0.5 cm. longo. Species pro cl. Susanna Ast, de Annonaceis indochinensibus peritissima, nominatur.

PERU: Dept. Junin, Prov. Huancayo, valley of Pariahuanca, between Panti and Rocchac, 2400 m. 1913, *Weberbauer 6536* (TYPUS in Gray Herb.).

One of the most distinct and peculiar species I have seen so far. The long acuminate calyx lobes suggest some affinities with *C. speciosus* from Venezuela and with *C. caldensis* from Brazil, but the vegetative characters are quite different and the ♀ flower is smaller.

Croton bryophoros, sp. nov.

Frutex vel arbuscula, 8–12 ped. altis, apicibus laete ochraceis, indumenti copia subbarbatis, tarde glabrescentibus, cortice vetustiore rugoso, rimoso. Folia rigide coriacea supra luteo-olivacea subscabrida, more proprio nempe resinosa corrugata, subtus tomento flocculoso detergibili griseo-olivacea, venis tomento fasciculato aurantiaco insignibus, 9–7 cm. longa, 5–3.5 cm. lata, ovato-elliptica, longiuscule acuminata vel subcuspidata, basi inciso-cordata, margine revoluta, venis optime pennineviis ascendentibus, 6–8-jugis, anastomosibus obscuris; petiolo laete ochraceo, hispide subbarbato, 3–5 cm. longo, glandulis minutis sub tomento oculate inquirendis. Cymae confertae, bisexuales, habitu incurvae bracteis, praesertim florum ♂, quam alabastris longioribus subcomosae, amentiformes (inde nomen specificum), brunneae, hispide lanulosae, ad 11 cm. longae, ad 0.3–0.4 cm. crassae. Flores ♀: calyce sub fructu ad basim partito, 0.7 cm. lato, lobis linearibus acuminatis, ca. 0.4 cm. longis, 0.1–0.125 cm. latis, glandulis hypogynis in annulum interruptum aggregatis, capsula glabrescente, subellipsoideo-trigona, 1 cm. longa, 0.8 cm. lata, semine plumbeo, utrinque grosse 3–4 ruguloso costatus, 0.5 cm. longo, 0.3 cm. lato, columella 0.6 cm. longa, apicibus incrassatis trifurca. Flores ♂ immaturi: alabastro hispido ca. 0.15 cm. magno, bracteis stipularibus setaceis ad 0.5 cm. longis, apice incurvis, integris.

PERU: Dept. Ayacucho, Carrapa between Huanta and Rio Apurimac, alt. 2800 m., wooded hillside, 1929, *Killip & Smith 22287* (TYPUS, U. S. Nat. Mus.).

When first seen, tentatively identified as *C. abutiloides* (type in herb. Berol; *Rose & Rose 22246,* vicinity of Huigra, Ecuador, in Gray Herb.) from which it differs in the peculiar texture of the leaves and in the comose catkin-like young cymes. A very distinct species, probably related to the *C. Baillonianus* complex.

Croton caladiifolius, sp. nov.

Arbor videtur, apicibus tomento subargillaceo citrino indutis. Folia supra olivacea, venis albicantibus tomentosis, caeterum glabrescentia, subtus tomento tenuiori induta griseo-olivacea, interdum colore lapideo peculiari, 25–13 cm. longa, 15–8 cm. lata, ovata, bene cordata, breviter cuspidata, margine subintegra ad morem congenerum tenuissime denticu-

lata, nervis ca. 10-jugis, adscendentibus; petiolo crasse herbaceo ad 15 cm. longo, glandulis stipitatis cerinis in apice 2–4. Cymae graciles ad 30 cm. longae, interdum unisexuales. Flores ♀ sparsi; calyce sessili fere ad basim partito, lobis haud imbricatis ligulatis, ad 0.3 cm. longis, 0.15 cm. latis, patentibus; ovario luteo-tomentoso ca. 0.2 cm. magno, stylis 3 gracilibus profunde partitis, 0.3 cm. longis, capsula gibboso-trigona ca. 0.4 cm. magna, semine undique transverse ruguloso, rugis ad 4 in facie quavis, 0.3 cm. longo, 0.2 cm. lato, caruncula depressa minima, columella 0.35 cm. longa. Flores ♂ in glomerulis ad 3–4 congregati pedicellis 0.2 cm. longis fulti; calyce ca. 0.3 cm. magno; staminibus ad 20, lobis petalis subaequilongis.

Bolivia: South Yungas, Chimari near Chuhumani, 1400 m. 1908, *Buchtien 4631* (typus, U. S. Nat. Mus.); North Yungas, Polo-Polo near Coroico, *Buchtien 3808* (U. S. Nat. Mus.); Guanai-Tipuani, 1892, *Bang 1343* (Arnold Arb.) huius loci videtur.

Almost intermediate in its essential character between *C. tarapotensis* and *C. Williamsii,* with a cordate leaf larger than either, mostly slaty-gray beneath. The seed is much more coarsely rugose and slightly larger than that of *C. tarapotensis* (as represented by *Spruce 4138,* in herb. Kew, 0.4 cm. long, 0.25 cm. broad). *Croton Williamsii* has smaller lobes of the ♀ calyx. *Croton peltophorus,* which is likely to prove identic to *C. pseudogracilipes,* is an endemic of the southern Bolivian Chaco, very closely allied with *C. Williamsii,* but altogether different from *C. caladiifolius.*

Croton emporiorum, sp. nov.

Frutex videtur, ramulis strictiuscule dichotomis, pube sordide ochracea hispidula in apicibus indutus. Folia supra olivaceo-brunnea glabrescentia, subtus sordide cinerea ad ochracea, tomento firmo, 7–4 cm. longa, 2.5–1 cm. lata, eximie elliptica, utrinque acuminata, apice plerumque mucronulata, margine integro, basi denticulis glandulosis utrinque 2–4 praedito, venis ca. 9-jugis, primo jugo subtriplinervio, caeteris penninerviis; petiolo 1–0.5 cm. longo, glandulis 2 late patelliformibus, sessilibus, in tomento suboccultatis. Cymae ad 4 cm. longae, hispido-tomentosae, bisexuales, compacte capitatae. Flores ♀ pedunculo ca. 0.15 cm. longo; calyce ad tertium inferum partito, ca. 0.6 cm. magno; lobis ligulato-ovatis, apice late acuminatis, 0.5 cm. longis, 0.175 cm. latis, utrinque tomentosis, ovario ca. 0.2 cm. magno, incluso, stylis 3 ad basim bipartitis, semine plumbeo sub lente puncticulato, 0.4 cm. longo, 0.2 cm. lato, caruncula minima, columella 0.45 cm. longa. Flores ♂ : staminibus ca. 20, ca. 0.4 cm. magno, lobis petalis subaequilongis.

SOUTHERN BOLIVIA: Toldos near Bermejo, 1900 m., *Fiebrig 2243* (TYPUS in Arnold Arb.).

Near *C. Hilari* from Uruguay and the only species of this affinity so far known in Bolivia. It is easily separated from *C. Hilari* by the much less thicker indument and by the larger, not whitish tomentose lobes of the ♀ calyx. Broadly interpreted it is one of the forms on the fringe of the vast and extremely complex group centering around *C. Pohlianus* and *C. Regnellianus*. This last should not be confused with *C. Regelianus* (in Martius, Flor. Brasil., 11^2: 133. 1873) which is an altogether different species and only by error is listed (op. cit., 738) as *C. Regnellianus*.

Croton nudulus, sp. nov.

Frutex videtur vel arbuscula, saltem in apicibus subherbaceus, forsan hinc inde glaucescens, fere totus glaber. Folia utrinque olivacea discoloria, pilis late stellatis ad limbum citius deciduis, sub marginem persistentibus, 9–8 cm. longa, 5–4.5 cm. lata, ovato-lanceolata, basi sat profunde cordata, margine subintegra ad serrulata, venis 7–10-jugis, primo jugo subtriplinervio ramigero, reliquis penninerviis; petiolo 3–6 cm. longo, glandulis utrinque 2–3, stipitatis. Cymae ad 16 cm. longae, bisexuales, herbaceae at validae, angulosae, stipulis triangularibus minimis bracteiformibus, floribus glomerulatis. Flores ♀ sessiles: calyce 0.4 cm. longo, 0.3 cm. lato, glaberrimo, lobis 8–10 in serie duplici late imbricatis, interioribus subpetaloideis, externis subfoliaceis costulatis parcius venulosis, omnibus integris; ovario globuloso sulcato, vix trigono, glaberrimo, incluso; stylis 3, bis partitis, crassis, in anthesi depressis ovariumque velut coronantibus. Flores ♂: calyce ca. 0.3 cm. magno, staminibus ca. 15, brevibus, lobis petalis subaequilongis.

BOLIVIA: Montecanto, in shrubbery at the fringe of a mountain wood, 2600 m. 1927, *Troll 637* (TYPUS, Herb. Berol.).

A very peculiar species on account of its ♀ floral characters, but at first sight easily mistaken for any one of the numerous species which it superficially resembles such as *C. Williamsii, C. caladiifolius, C. peltophorus*, etc. The double row of broadly imbricate lobes in the ♀ calyx, scarcely worthy of being separately distinguished as sepals and petals, is found in no other species which I have seen so far and is the best character of identification together with the pale olivaceous subglabrous to glabrous vegetative parts and the persistently ciliolate margin of the leaves.

Croton perspeciosus, sp. nov.

Arbuscula 4–5 ped. alta, apicibus pube subsericea sordide ochracea

hispida indutis primo intuito bene *C. speciosum* in mentem vocans. Folia atroviridia vel brunneo-olivacea supra venis hispidulis exceptis glabrescentia, subtus tomento fasciculato adpresso grisea, 24–12 cm. longa, 14–7.5 cm. lata, ovata vel (e folio unico obvio) denticulo ca. 1 cm. longo sublobulata, longe triangulari-acuminata, apice breviter mucronata, basi optime cordata, margine minutissime denticulato-serrata, venis late arcuatis penninerviis, 7–8-jugis, primo jugo ramigero; petiolo 14–7 cm. longo, glandulis stipitatis sub apicem 4–8, stipulis basalibus pinnatosectis ad 1.3 cm. longis, 0.35 cm. latis. Cymae bisexuales, quoad visae nec ultra 10 cm. longae. Flores ♀ deflorati brevissime pedicellati, pedicello 0.25 cm. longo; calyce vix 1 cm. lato, lobis triangularibus integris, 0.4–0.35 cm. longis, ca. 0.25 cm. latis, intus glabris, semine badio nitidiusculo, grosse ruguloso, rugis paucis, 0.6 cm. longo, 0.55 cm. lato, caruncula apicali late transversali ad 0.2 cm. lata, columella ad 0.7 cm. longa, epicarpio secedente processibus luteis stelligeris crassissime pannoso. Flores ♂ immaturi: alabastro ca. 0.25 cm. magno pedicello 0.5–0.4 cm. longo.

PERU: Dept. Ayacucho, Aina, between Huanta and Rio Apurimac, 750–1000 m., open woods, 1929, *Killip & Smith 22841* (TYPUS, U. S. Nat. Mus.); Carrapa, between Huanta and Rio Apurimac alt. about 1500 m., densely forested valley 1929, *Killip & Smith 22402* (U. S. Nat. Mus.).

This is one of several species that is mistakenly identified as *C. callicarpaefolius* in herbaria and in floristic works. It strongly suggests some of the forms of *C. speciosus* in the indument, size and habit of vegetative parts but is altogether unlike this species in the narrow lobes of the ♀ calyx.

In treating *C. callicarpaefolius*, Mueller Arg. (in DC. 15[2]: 532. 1866) recognizes a typical form, var. *genuinus*, and a hairy variety, var. *pubescens*. Under the former he lists the Peruvian specimen in the herbarium of Jussieu which is the type of *C. callicarpaefolius* Vahl ex Geiseler, and a Venezuelan specimen collected by Fendler apparently near Colonia Tovar. Under the latter he cites another specimen of Fendler collected at Colonia Tovar and a Moritz number from the same locality, both of which I have seen. It is manifest that *C. callicarpaefolius* as understood by Mueller is a geographic mixture. Worthy of notice is the fact that, on the faith of Mueller, the variety is more pubescent than the type.

Geiseler's publication of *C. callicarpaefolius*, typified by the Jussieuan specimen, is preceded (Crot. Monogr. 36. 1807) by the description of *C. quadrisetus* (actually, *C. quadrisetosus* Lam.). In this description Geiseler states that the specimen of Lamarck has only ♂ flowers, which

is erroneous, as young fruits occur on this specimen which I have seen. Geiseler further errs in listing *C. pungens* as a synonym of *C. quadrisetosus* and in citing as habitat "in Peru, ad Caracas." I cannot refer Geiseler's *C. quadrisetus* to any species which I may identify from description. It is certain that Geiseler misunderstands *C. quadrisetosus* and that, on the other hand, his description of *C. callicarpaefolius* well agrees with the Lamarckian species including the "glandulae 4 pedicellatae, capitatae ad apicem petioli" of which he writes. The entire trend of the literature indicates that both Geiseler and Mueller Arg. are confused, and the descriptions clearly point to *C. callicarpaefolius* and *C. quadrisetosus* as being of the same species, the types of both having probably been collected in Peru by Dombey at the same time.

I much regret not having critically compared the specimen of Lamarck with that of Jussieu in order to settle the issue. However, the remote risk of publishing a synonym, if the specimen of Jussieu should indeed prove to be different from that of Lamarck, does not justify the positive evil of further allowing several important species to be confused or to remain undescribed. *Croton quadrisetosus* is certainly distinct from *C. perspeciosus* in pubescence and in the character of the ♂ and ♀ flowers. It is likewise altogether different from *C. callicarpaefolius* var. *pubescens*, sensu Mueller Arg., which will be discussed in a following paper.

Croton Rehderianus, sp. nov.

Stirps concinna, laete colorata, habitu speciminis maximi Julocrotonis triquetri, apicibus subherbaceis tomento rufidulo scaberrimo indutis. Folia olivacea ad rufidula, supra lepidibus stellatis asperata, subtus tomento flocculoso late stellato subgrisea, 22–12 cm. longa, 9–5 cm. lata, ovato-caudata vel sublanceolata acuminata, basi eximie cordata vel incisocordata, margine leviter glanduloso-serrulata, venis luteo-pubescentibus, inaequaliter 10–12-jugis, ascendentibus, subquintuplinerviis; petiolo canaliculato, 4–3.5 cm. longo, glandulis utrinque binis sessilibus instructo, anticis minoribus. Cymae pro ratione stirpis parvae, quoad visae 5 cm. vix excedentia, vulgo verosimiliter longiora, bisexuales, rufidulae. Flores ♀ in axilla bracteolae calyci subaequilongae solitarii subsessiles, ca. 0.35 cm. magni; lobis triangularibus 0.2–0.175 cm. longis, 0.05 cm. latis, ovario ca. 0.2 cm. magno, vulpino-brunneo, grosse tomentoso, globuloso, stylis 3, crassis, ad apicem breviter bifidis, glabris ca. 0.3 cm. longis. Flores ♂ caeteraque desiderantur. Nomen specificum cl. A. Rehder dicatur.

PERU: Dept. Cuzco, below Machu-Picchu, brush covered hillside alt.

2250 m., "very handsome, beautiful tomentum: Mocco-Mocco" 1936. *J. West 6464* (TYPUS in Gray Herb.).

A remarkable species that in color and habit simulates the Brazilian endemic, *Julocroton triqueter,* but in every floral character is typically *Croton*. Its affinities are still obscure. They are to be looked for apparently in the vicinity of *C. bryophoros*.

Croton rubiginosus, sp. nov.

Fruticulus dichotome vel verticillatim ramosus, vix 50 cm. altus, apicibus brunneis totis pilis sub lente in apice stellatim partitis more proprio nempe rubigine confectis ac esquamatis. Folia rufescentia, eodem modo ac apices induta, concoloria, 2–1.5 cm. longa, 1–0.8 cm. lata, ovata vel ovato-acuminata, basi rotundata, margine inconspicue serrulata, venis obscuris 3–5-jugis adscendentibus; petiolo gracili 0.5 cm. longo eglanduloso. Cymae bisexuales ad 1.5 cm. longae. Flores ♀: pedicello vix 0.1 cm. longo, calyce ca. 0.4 cm. longo, 0.3 cm. lato, lobis margine pilis subpaucis glandulosis obsitis, 0.2 cm. longis, 0.175 cm. latis, plus minusve ellipticis, apice rotundatis, ovario globuloso-trigono, lanuloso-tomentoso submaturo fere glabro, stylis 3 ad basim iter partitis, glabris. Flores ♂ ca. 0.2 cm. magnis, staminibus 8–10, petalis glabris quam lobis duplo longioribus.

PERU: Prov. Chachapoyas, eastern banks of the Marañon above Balsas, open grassy land, 2000–2100 m. 1904, *Weberbauer 4273* (TYPUS, Herb. Berol).

A dwarf shrub appearing rusty-scurfy. It may easily be mistaken for *C. Boissieri,* of which it has the habit in herbarium, but this is basically lepidote and has entire calyx lobes, belonging to the very different group of *C. buxifolius* - *C. argentinus*. Its nearest true affinities are with *C. eschatos* from Mexico, with *C. ovalifolius* from the West Indies and with *C. Venturii* from Argentina. It is the only member of this group at present reported from Peru.

Croton Tyndaridum, sp. nov.

Arbor, 15–20 ped. alta, apicibus totis pube capitato-stelligera ochraceo-carnea incrassatis. Folia supra olivacea, tomento detergibili glabrescentia, subtus pallide grisea, tomentosa, 16–10 cm. longa, 14–10 cm. lata, exacte ovato-rotundata, breviter acuminata, margine subintegra levissime denticulata, venis ca. 8-jugis, primo jugo subtriplinervio eximie ramigero, late arcuato-adscendentibus, trabeculis tomentulosis subtus more Tiliacearum concinnis; petiolo subtus in apice subocculte biglanduligero, 13–7 cm. longo, tomenti copia incrassato. Cymae ad

25 cm. longae, tantum floribus ♀ praedita visa. Flores ♀ pedicellati; pedicello anthesi vix peracta ca. 0.3 cm. longo, calyce late partito, 0.5 cm. lato, 0.3 cm. longo, lobis ovatis acuminatis leviter imbricativis, 0.3 cm. longis, 0.15 cm. latis; ovario 0.4 cm. lato, 0.3 cm. longo, subincluso, tomento pallide ochraceo hispidulo; stylis 3, ad basim partitis, vix 0.25 cm. longis. Caetera desiderantur. Nomen specificum in honorem cl. Killip & Smith desumpsi qui velut botanici fratres Tyndarides floram Americanam lustraverunt.

PERU: Dept. Junin, along Rio Perene, near "Hacienda 3," in thickets, 600 m. 1929, *Killip & Smith 25229* (TYPUS, U. S. Nat. Mus.).

A very interesting form, much resembling *C. Steyermarkianus* from Costarica, but with the indument of *C. gossypiifolius* from Trinidad and Venezuela. It suggests a possible link between the *C. gossypiifolius* aggregate, which is essentially Andine and Central American, and the *C. Urucurana* group which is endemic to eastern and western Brazil. Better material, however, is needed to define its relationships with certainty. Apparently the only known form of this kind in Peru.

Croton xanthochylus, sp. nov.

Arbuscula cortice pallido, ad 4 m. alta, apicibus pube fasciculato-stellata valde appressa parcius indutis. Folia membranacea supra tabacina, glabra, sub lente forti laevissime granulosa, subtus tomento deciduo inconspicue grisea, 8–6 cm. longa, 5–4 cm. lata, in specimine typico optime ovato-cuspidata, basi cordata, margine integra, venis penninerviis tenuibus at perspicuis, ca. 8-jugis, anastomosatis; petiolo gracili, 4–2.5 cm. longo, subtus in apice glandulis patelliformibus nigricantibus subsessilibus binis obsito. Cymae bisexuales, graciles, ad 4 cm. longae: flores ♀ subsessiles (pedunculo vix 0.05 cm. longo), minuti, calyce vix 0.2 cm. magno, lobis subsetaceis ad 0.1 cm. longis, ovario globoso ca. 0.15 cm. magno, luteo-tomentello, glandulis hypogynis facile lente inquirendis, stylis vix 0.15 cm. longis; capsula globoso-trigona, subglabra, ca. 0.3 cm. magna, semine brunneo, 0.25 cm. longo, 0.2 cm. lato, puncticulato, grosse ruguloso, columella fructu delapso ca. 0.3 cm. longa. Flores ♂ pedicello ca. 0.2 cm. longo fulti, vix 0.2 cm. magni, staminibus ca. 10–12.

PERU: La Merced, about 2000 ft., sandy flat, light-barked tree, 1923, *MacBride 5308* (TYPUS, Arnold Arb.).

Very close to *C. erythrochylus,* the type of which, however, has a sublepidote argillaceous indument, distinctly pedicelled ♀ flowers (pedicel about 0.15 cm. long), ovaries colored dark orange, larger and more

clasping calyx lobes and apparently, a slightly rounder and less rugulose seed. *Croton Lechleri* is a more robust species, with capsules similar to those of *C. xanthochylus,* but with larger leaves of the texture and indument of those of *C. draconoides* and *C. panamensis.* It is not excluded that *C. xanthochylus* or some unreported related form may yet prove to be the link connecting the *C. Scouleri-C. Pavonis* affinity with the *C. tarapotensis-C. pungens* group.

Croton yungensis, sp. nov.

Croton pungens, Rusby in Mem. Torrey Bot. Club **4**: 257. 1895. Non Jacq.

Arbuscula videtur, apicibus pallide ochraceis, tomentoso-hispidis. Folia supra pallide brunnea, tomento sat persistenti subsimplici hinc inde pilosa, subtus tomento raro late stellato grisea, 10–6 cm. longa, 6–2.5 cm. lata, ovato-elliptica, longe acuminata, basi cordata, venis adscendentibus conspicuis haud anastomosatis ca. 6-jugis, primo jugo ad basim grosse ramigero quapropter lamina haud raro subquintuplinervia, caeterum penninerviis; petiolo 3.5–2 cm. longo, glandulis subtus utrinque 2, patelliformibus. Cymae bisexuales ad 12 cm. longae valde angulosae. Flores ♀ pedunculo ca. 0.2 cm. longo crassiusculo fulti, calyce deflorato ad basim partito, 0.4–0.3 cm. lato, lobis lineari-triangularibus ca. 0.2 cm. longis, petalis (scilicet glandulis e petalis congestis) minutis, bacilliformibus, semine subellipsoideo, 0.4 cm. longo, 0.2 cm. lato, grosse rugoso columella 0.3 cm. longa. Flores ♂ pedicello 0.3–0.25 cm. longo fulti, ca. 0.25 cm. magni, staminibus ca. 18, lobis petalis subaequilongis.

Bolivia: Yungas, 1890, *Bang 278* (typus, N. Y. Bot. Gard.).

Identified by Rusby as *C. pungens* which is endemic to Venezuela, and even very broadly interpreted, does not occur further south than eastern Colombia. *Croton yungensis* is very close to hispid-pubescent states of *C. Hasslerianus,* which occurs in northwestern Paraguay. Although fairly large material collected by Balansa, Hassler and Schade is available in herbaria, I have not been able to decide whether *C. sarcopetaloides* and *C. Hasslerianus* are to be treated as separate species. From both these plants, *C. yungensis* is distinguished by the range, by the smaller leaves, by the more intricately ramose habit and by intangibles of flowers that make it an undoubtedly good species in various degrees intermediate among *C. Ruizianus* from Peru, *C. pungens* from Venezuela, *C. sarcopetaloides* from western Brazil, *C. Hasslerianus* from Paraguay and *C. sarcopetalus* from northern Argentina. *Croton Williamsii* and *C. peltophorus* have more membranous and less heavily hairy leaves and a more southern Bolivian range.

ARGENTINE SPECIES

Croton Beetlei, sp. nov.

Specimen typicum sistit ramulum ♂ anthesi nondum perfecta, apicibus tomento furfuraceo subcontiguo pilisque fasciculatis griseo-puberulis. Folia membranacea brunnea ad tetre discoloria, subtus pube laevi grisea, supra pube hinc inde sparsa vix pilosa, pilis primo intuito lepides argenteos mentientibus, sub lente fortiori revera stellatis, 14–5 cm. longa, 13–4 cm. lata, plerumque ovato-rotundata, margine crenato-dentata, dentibus inter crenas positis puberulis; venis ca. 5-jugis, primo jugo 3- ad 5-plinervio, caeteris penninerviis, latius arcuatis; petiolo canaliculato 7–2.5 cm. longo, glandulis ad apicem supra 2 tubuloso-turbinatis. Cymae gracillimae ad 8 cm. longae, parcius griseo-tomentosae, ♂ tantum visae. Floribus ad 5 in glomerulo quove, alabastro griseo ca. 0.1 cm. magno, pedicello gracili 0.3 cm. longo.

ARGENTINA: Salta, Dept. Oran, Tarija near Volcan, on the Bolivian border, sandy loam, alt. 800 m., tree 15–20 m. 1938, *Eyerdam & Beetle 22829* (TYPUS in Gray Herb.).

Although the type-specimen is incomplete, its representing an unreported species must be taken for granted. *Croton Beetlei* belongs to one of the largest and on the whole, to one of the most stable complexes of the American end of the genus. In this complex fall *C. mexicanus* (central and southern Mexico), *C. Lundellii* (Yucatan), *C. Tonduzii* (Costa Rica), *C. corylifolius* (French West Indies), *C. cubanus* (Cuba), *C. caracasanus* (Venezuela) and one other species or variety collected in Ecuador, which is to be discussed in a coming paper. All these plants differ in herbaria only slightly in details of floral structure and pubescence. These details, however, must be given consideration lest the whole complex be turned into one overcomprehensive unit, or arbitrarily grouped under binomials and trinomials lacking phytogeographic significance. In its vegetative characters and indument, *C. Beetlei* is nearest to *C. mexicanus*, from which, so far as I have learned, it can not certainly be separated in the absence of the record of collection. I am inclined to believe that *Steinbach 8145*, woods of Jorochito, Santa Cruz, Bolivia (in herb. Mus. Stockholm) represents *C. Beetlei*, the localities of the Eyerdam & Beetle and of the Steinbach collections being included within one common, or very nearly common floristic range. The Steinbach specimen has mature ♂ flowers which may be described as follows: calyx 0.5 cm. broad; lobes lanceolate-ovate 0.2 cm. long, 0.15 cm. broad; stamens about 15; petals ligulate, 0.2 cm. long, 0.1 cm. broad; lanulose throughout; glands 4–5, irregularly arranged at the bottom of the calyx.

The fact that in the herbarium *C. Beetlei* and *C. mexicanus* are almost invariably represented by ♂ specimens, tends to indicate that they are markedly polygamous, the ♀ inflorescences being apparently borne on the highest branches.

Croton curiosus, sp. nov.

Fruticulus ad 0.6 m. altus, ramos plurimos florigeros ad 0.20 m. longos e caulibus vetustioribus edens, lepidibus laete ochraceis argillaceo-scabridis persistentibus indutos. Folia nigro-viridia, supra lepidibus argillaceis subnullis subtus hinc inde sparsis ruvidula, in specimine typico habitu conduplicata, 2.5 cm. longa, 1 cm. lata vel minora, lanceolata, integra, venis atris, adscendentibus ca. 6-jugis, petiolo ca. 0.5 cm. longo, glandulis stipitatis suprapetiolaribus binis. Cymae laete ochraceae, bisexuales, ad 7 cm. longae, flores solitarios pro more generis pauciores ad 6–8, interdum ad 12 gerentes. Flores ♀ pedicello 1.5 cm. longo fulti; calyce per anthesin ca. 0.2 cm. magno, laciniis triangularibus haud imbricativis ovario subaequilongis; ovario argillaceo-tomentello, serius glabrescenti, ca. 0.2 cm. magno; stylis primo intuito obviis, carnosulis, ovario longioribus, fere ad basim partitis; semine plumbeo puncticulato 0.45 cm. longo, 0.35 cm. lato. Flores ♂ immaturi.

ARGENTINA: Salta, Rosario de Lerma, on the road to Nevado Castillo 2000 m., in boulders on the bottom of a gulch, 1929, *Venturi 8664* (TYPUS in U. S. Nat. Mus.).

On the whole, a well marked species with obscure affinities. Its floral characters suggest a relationship with *C. andinus* (which I am unable to separate from *C. psammophilus*) and *C. pedicellatus,* but these species are quite different in indument and habit and scarcely suggest *C. curiosus* on sight. It may actually be related to *C. alnifolius,* from Peru.

In the herbarium of the Arnold Arboretum is preserved a poor specimen which might be the present species or a variety of it. According to the label, it was collected by Frère Apollinaire at La Vega near Bogota, Colombia, in 1909 and bears the mss. determination, *C. Apollinaris* followed by an illegible signature. Apparently by the same hand are written labels on other specimens of South American *Croton* which have a questionable origin. Some of the specimens so labelled are manifestly out of their range, the indications on the ticket being in conflict with the known distribution of the species. This fact, not less than my inability to find the place of publication and to decipher the name of the author have suggested that the mss. binomial be disregarded and a new one proposed in its stead.

Croton Venturii, sp. nov.

Croton siderophyllus var. *hirsutus* Griseb. Symb. Flor. Argent. 56. 1879. Non Mueller Arg.

Fruticulus ad 0.30 m. altus, e caudice ligneo validiusculo, intricato ramulos plurimos sublentos edens, in apicibus pilis sparsis setoso-canescentibus hirtellis obsitos. Folia tabacina, vix pilis sparsis fasciculato-stellatis hirtella, pro more 2 cm. longa, 0.5 cm. lata, elliptica vel ovato-elliptica, margine serraturis creberrimis glanduloso-viscosis nempe eroso-denticulata, venis obscure ac gracillime 3-plinerviis; petiolo gracili ad 2 cm. longo. Cymae vix 2–3 cm. longae, bisexuales, haud comosae. Flores ♀ pedicello 0.2 cm. longo fulti; calyce ca. 0.3 cm. magno, lobis ligulatis, haud reduplicativis, habitu erectis, apice herbaceis, dorso canescentibus, margine creberrime brevissimeque glanduloso-viscosis; ovario incluso hispido-canescenti, stylis profunde partitis, ca. 0.2 cm. longis, semine 0.4 cm. longo, 0.25 cm. lato, parcius ruguloso. Flores ♂ staminibus ca. 12, alabastro subglabro, lobis petala subaequantibus, 0.2 cm. longis, 0.15 cm. latis.

ARGENTINA: Boundary between province of Tucuman and Salta, Rio del Tala, *Lorentz & Hieronymus 392* (TYPUS in Herb. H. B. Gotting.); Salta, Dept. Antillas, Cerro Negro, 750 m. 1930, *Venturi 10295* (in Herb. Arnold Arb.); Santiago del Estero, Cerro del Remate 550 m., *Venturi 5899* (in Herb. Mus. Stockholm).

The trinomial used by Grisebach cannot be made the base of a new combination because it was introduced for *C. siderophyllus β. hirsutus* (in DC. Prodr. 15^{2}: 650. 1866) endemic in eastern Brazil, and wholly unrelated to the present species. In addition, *C. hirsutus* Pet. Th. and *C. hirsutus* Vell. are already extant in the record. The present species is not *C. Bonplandianus* (*C. pauperulus*, *C. sparsiflorus*, *C. rivinaefolius*) a widespread weed with range: southern Bolivia, northwest and northeast subtropical Argentina, Paraguay, Uruguay, southwest Brazil, now introduced into India and there rapidly spreading. The nearest affinities of *C. Venturii* are with the numerous species forming the complex that includes *C. serratifolius*, *C. ovalifolius*, *C. rubiginosus*, *C. eschatos* and, more distantly, *C. fuscus* and its allies. This complex extends from central Mexico to subtropical Argentina, but has its epicenter in the valley of the Paraná and its tributaries.

BRAZILIAN SPECIES

Croton Dusenii, sp. nov.

Fruticulus videtur dioecus, habitu *Rosmarini officinalis*, strictiuscule ramulosus, in apicibus pube sordide albicante furfuraceo-tomentellus.

Folia brunnea, supra glabrescentia, subtus pallida, pube sordida lepidoto-stellata tomentosa, 2–1 cm. longa, 0.5–0.25 cm. lata, spathulata ad sublinearia, margine revoluto, nervo medio utrinque conspicuo, venis supra impressis, 5–6-jugis, subtus oculo nullis. Cymae minimae, paucifloraе. Flores ♀ pedicello ca. 0.2 cm. longo fulti; calyce deflorato ca. 0.5 cm. lato, lobis 0.3 cm. longis, 0.75 cm. latis spatulatis, margine integris, apice rotundatis, fere ad basim liberis; semine badio laevi, 0.25 cm. longo, 0.1 cm. lato, columella, fructu delapso 0.3 cm. longa. Flores ♂ pedicello gracili 0.2 cm. fulti, staminibus ca. 8–10, 0.4 cm. latis, petalis ligulatis glabris lobis subaequilongis.

Brazil: Paraná, Calmon[1] in subpaludosis, 1910, *Dusén 9265* (typus in Herb. Stockholm).

The habit of *C. Dusenii* is that of a Rosemary with numerous short spurs (brachyblasts), mostly fertile, arising from the axils of the larger leaves alongside the stems. Its relationships appear to lie in the direction of *C. Tartonraira* and *C. pycnocephalus*. From these species it is easily separated by the peculiar indument. From the last named it differs, in addition, in the pale tomentulose lobes of the ♀ calyx. *Croton argentinus* and *C. serpyllifolius* which in floral characters resemble the present species are distinct from it, the first in the leaf being almost evenly hairy on both faces, the latter in being lepidote.

Arnold Arboretum,
Harvard University.

[1]According to the best available atlases Calmon is not in the State of Paraná, as reported by Dusén, but in that of Santa Catharina, about 20 miles south of Porto Unido, on the Rio Iguassú. Another town, almost of the same name, Miguel Calmon, is in the State of São Paulo, near Pennapolis, but may not be the place of collection of the present specimen.

THE OCHNACEOUS GENUS CAPUSIA H. LECOMTE (1926) A SYNONYM OF THE CELASTRACEOUS SIPHONODON GRIFFITH (1844)

E. D. MERRILL

TWO SPECIMENS of *Poilane 10805*, cited in the original description of *Capusia annamensis* H. Lecomte, recently received at the Arnold Arboretum, directed my attention to the status of Lecomte's recently proposed new genus, for the reason that, at sight, I had assigned the sheets to the Celastraceae without first looking up the group in which Lecomte placed his supposed new genus. A more critical examination of the material, supplemented by an examination of Lecomte's detailed description and excellent illustrations, at once indicated that his supposed new ochnaceous genus *Capusia* was actually the same as *Siphonodon* Griffith, a somewhat anomalous genus of the Celastraceae. While the generic identity of the two entities is unmistakable, the species apparently represents a form distinct from the widely distributed *Siphonodon celastrineus* Griff., and in reducing *Capusia* to *Siphonodon,* the following new combination is made:

Siphonodon annamensis (H. Lecomte), comb. nov.

Capusia annamensis H. Lecomte, Bull. Mus. Hist. Nat. [Paris] **23**: 96. *f. 1–2*. 1926.

Lecomte's Indo-Chinese species was based on a series of specimens collected by Poilane, of which I have seen two sheets of *Poilane 10805*. It is closely allied to the widely distributed Indo-Malaysian *Siphonodon celastrineus* Griff., yet it seems to be distinct in its constantly 1-flowered inflorescences and in the somewhat accrescent calyx tubes that persist on the young fruits. Griffith's species is characterized by its several- to many-flowered axillary inflorescences. While it is perhaps understandable why Lecomte proposed and described this as a new genus, since *Siphonodon* is somewhat anomalous in the *Celastraceae*, it is very difficult to understand why he placed *Capusia* in the Ochnaceae. As I interpret its morphological characters, *Capusia* = *Siphonodon,* presents nothing that could be properly interpreted as ochnaceous in its floral or fruit structure, nor in its vegetative characters. Again, in view of the fact that Pierre, Fl. Forest. Cochinch. **4**: *t. 312A*. 1891, illustrated and

described *Siphonodon celastrineus* Griff. in detail, and stated that it was very common in lower Cochinchina (a statement repeated by Pitard in Lecomte Fl. Gén. Indo-Chine **1**: 907. *t. 114, 9–11.* 1912, who also gave a detailed description and illustration of it) Lecomte's *lapsus* becomes more difficult to understand. He was apparently misled by the gynoecium characters, which he misinterpreted, and ignored the obviously celastraceous characters of the other organs. Further illustrations of Griffith's species appear in the latter's original paper, Calcutta Jour. Nat. Hist. **4**: 247. *t. 14.* 1844, in Hooker f. Trans. Linn. Soc. **22**: *t. 26.* 1857, where a detailed morphological study of the genus is given, in Schnizlein, Iconogr. **4**: *t. 237.* 1866–70, and in Koorders, Atlas Baumart. Java **1**: *t. 140.* 1913. Other species of the genus are illustrated by Maiden, For. Fl. N. S. Wales **2**: *t. 64.* 1905, and by F. M. Bailey, Compreh. Cat. Queensl. Pl. 102. 1913; the last cited illustration is very poor.

Arnold Arboretum,
Harvard University.

NOTES ON ROSA AND PRUNUS

FRANKLIN P. METCALF*

IN CONNECTION with my work on the Rosaceae for the Flora of Fukien, a number of nomenclatural changes have been found necessary. These, in conformity with my usual policy, are now being published previous to the completion of the "Flora of Fukien." In this paper four new varieties are described; in addition three new combinations have been made, two species are here first recorded from the Province of Kwangtung and the range of one additional species has been extended to include Chekiang.

I wish to express my appreciation and thanks to Dr. E. D. Merrill, Administrator of Botanical Collections, Harvard University, and Director of the Arnold Arboretum, and to Professor Alfred Rehder, Curator of the Herbarium of the Arnold Arboretum, for making available all collections and research facilities at the Arnold Arboretum.

Rosa filipes Rehder & Wilson in Sargent, Pl. Wils. **2:** 341 (1915).

Characterized by subglabrous shoots and leaflets, which are gland dotted beneath, large paniculate inflorescences of moderately large flowers on filiform glandular pedicels.

KWANGTUNG: Jui-feng, Loh-cheng, Ying Tsiang 1296 (AA).**

This has been compared with the type, Wilson 1778 from Szechwan (AA). It is rather unusual to find this western species in the mountains of Kwangtung. New record for Kwangtung.

Rosa Henryi Boulenger var. **australis** (Rehder & Wilson), comb. nov.

Rosa Gentiliana Rehder & Wilson (*non* Lévl. & Van.) var. *australis* Rehder & Wilson in Sargent, Pl. Wils. **2:** 336 (1915).

Rosa Brunonis Hance in Jour. Linn. Soc. **13:** 115 (1873), non Wallich.

Rosa moschata Dunn & Tutcher in Fl. Kwangt. Hongk. 96 (1912), and Bentham, Fl. Hongk. 106 (1861), non Miller.

Characterized by the narrower and smaller, more or less curved acuminate leaflets (2.5–6 cm. long) and the fewer-flowered corymbs.

Common in Fukien!

*Contribution from the Botanical Survey, Lingnan University, Canton, China.

**AA Arnold Arboretum; CCC Lingnan University (Canton Christian College).

Boulenger* shows that the *R. Gentiliana* of Rehder and Wilson was not the same as the *R. Gentiliana* Léveillé & Vaniot. The Rehder and Wilson variety is here transferred to *R. Henryi* Boulenger.

Rosa Henryi Boulenger var. **puberula** (Handel-Mazzetti), var. nov.

Rosa Gentiliana Rehder & Wilson (*non* Lévl. & Van.) forma *puberula* Hand.-Mazz. Symb. Sin. **7**: 525 (1933).

Differt praesertim foliolis et rachibus subtus puberulis.

Characterized primarily by the puberulent leaflets beneath and puberulent rachis.

KWANGSI: Pinghsiang, Wang-Te-Hui 149 (Arnold Arboretum and Hand.-Mazz. l.c.).

Rosa multiflora Thunb. Fl. Jap. 214 (1784) var. **villosula**, var. nov.

Pedicellis, ramulis tenellis et foliolis subtus villosis.

KWANGSI: Shap Man Taai Shan, Southeast of Shang-sze, Tsang 22153 (CCC & AA). Rehder formerly determined this number as the var. *brachyacantha* Rehder & Wilson of *multiflora* Thunberg. This variety according to Rehder and Wilson (in Sargent, Pl. Wils. **2**: 334 [1915]) does not have pubescent pedicels, but actually one of the specimens cited has the pedicels glabrous, the other stipitate-glandular. The specimen Tsang 22153 has distinctly villous pedicels.

Ching 1556 from Chekiang (AA) is apparently the same variety, the pedicels and calyx are slightly more villous, and the branches more weak and flexuous, and fewer flowered.

Rosa kwangtungensis Yü & Tsai in Bull. Fan Mem. Instit. Biol. **7**(3): 114 (1936) var. **mollis**, var. nov.

Pedicellis et calycis lobis dense villoso-tomentosis; foliolis et rachibus dense et molliter villosis; floribus plenis.

Pedicels and calyx lobes densely villous-tomentose. Leaflets and rachis more densely and softly villous. Flowers double. Probably an escape from cultivation.

FUKIEN: Amoy, Nanputo, Chung 4894 (AA) and 4894B (CCC). KWANGTUNG: Honan Island, CCC 2089 (Levine) (CCC). KWANGSI: Watlam, LU 19804 (Fung Hom).

Prunus campanulata Maxim. in Bull. Acad. Sci. St. Pétersb. **29**: 103 (Mél. Biol. **11**: 698) (1883); Koehne in Sargent, Pl. Wils. **1**: 253 (1912); Hand.-Mazz. Symb. Sin. **7**: 531 (1933); Sealy in Bot. Mag. **162**: t. 9575 (1939).

*Boulenger in Ann. Sci. Soc. Bruxelles **53**, Ser. B: 143 (1933) and in Bull. Jard. Bot. Bruxelles **9**: 231 (1933); Rehder in Jour. Arnold Arb. **17**: 338 (1936).

CHEKIANG: East Tien-mu, H. H. Hu 1593 (AA). This apparently is the first record for Chekiang. Not reported by Cheng in his Enumeration of Vascular Plants of Chekiang. The species was formerly only known from Fukien, Hunan, Formosa, and Japan.

Prunus caudata (Hance) Koidzumi in Jour. Coll. Sci. Tokyo **34**: 257 (1913).

Celtis caudata Hance in Ann. Sci. Nat. ser. 5, **5**: 42 (1865).

Prunus pogonostyla Maxim. in Bull. Soc. Nat. Moscou **54**: 11 (1879); Hemsley in Jour. Linn. Soc. **23**: 221 (1887).

Yunnan.

Prunus caudata (Hance) Koidzumi var. **globosa** (Koehne), comb. nov.

Prunus pogonostyla Maxim. var. *globosa* Koehne in Sargent, Pl. Wils. **1**: 265 (1912).

Fukien and Formosa.

Koidzumi (l.c.) reduced *P. pogonostyla* Maxim. to *P. caudata* (Hance) Koidz. but the two varieties described by Koehne have never been transferred to that species.

Prunus caudata (Hance) Koidzumi var. **obovata** (Koehne), comb. nov.

Prunus pogonostyla Maxim. var. *obovata* Koehne in Sargent, Pl. Wils. **1**: 265 (1912).

Formosa only.

Prunus Wallichii* Steud. var. **crenulata,** var. nov.

Differt a forma typica foliis margine crenulatis.

KIANGSI: On Chi Shan, Lungnan District, Lau 4642, 4691, Oct. 1–20, 1934 (AA and CCC). These two were originally cited as the species by Merrill (l.c.) and credited to Kwangsi (typographical error).

Prunus Buergeriana Miquel var. **nudiuscula** Koehne in Sargent, Pl. Wils. **1**: 60 (1911).

KWANGTUNG: Ying-tak, CCC 14745 and 14749 (Tsang and Wang) in Herbarium, Botanical Survey, Lingnan University. This is the first record for Kwangtung.

Formerly known from Chekiang and Hupeh. The species is known from Japan.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

Prunus Wallichii* Steud. Nomenclat. Ed. 2, **2: 404 (1841); Merr. in Contrib. Arnold Arb. **8**: 72 (1934) and in Jour. Arnold Arb. **19**: 35 (1938).

A NOTE ON JASMINUM DIVERSIFOLIUM VAR. GLABRICYMOSUM

CLARENCE E. KOBUSKI

IN A RECENT LETTER, Mr. B. O. Mulligan of the Royal Horticultural Society's Gardens at Wisley, kindly drew my attention to an error made in the Jour. Arnold Arb. **20**: 404. 1939. To my chagrin, this error is the result of a "lapsus calami" made in recording incorrectly (Jour. Arnold Arb. **13**: 149. 1932) a combination of Sir William Wright Smith's. I am very grateful to Mr. Mulligan for his interest in this matter and I am presenting below a revised treatment of the variety in question.

Jasminum diversifolium Kobuski var. **glabricymosum** (W. W. Smith), comb. nov.

Jasminum heterophyllum Roxburgh var. *glabricymosum* W. W. Smith in Notes Roy. Bot. Gard. Edinburgh, **12**: 209. 1920.

Jasminum heterophyllum Roxburgh var. *glabricorymbosum* Kobuski in Jour. Arnold Arb. **13**: 149. 1932, lapsus calami pro "glabricymosum."

Jasminum diversifolium Kobuski var. *glabricorymbosum* Kobuski in Jour. Arnold Arb. **20**: 404. 1939, lapsus calami pro "glabricymosum."

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.